TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

LEIDY SOUTH PROJECT
HENSEL REPLACEMENT - WESTERN AND EASTERN TERMINUS MAIN LINE VALVES

LEIDY AND CHAPMAN TOWNSHIPS, CLINTON COUNTY, PENNSYLVANIA

SEPTEMBER 2019
(REVISED MAY 2020)

PROJECT OWNER/APPLICANT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
2800 POST OAK BLVD. LEVEL 11
HOUSTON, TX. 77056
PH: (713) 215-3427
CONTACT: JOSEPH DEAN, ENVIRONMENTAL MANAGER

PLAN PREPARER / ENGINEER

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CONTACT: KEVIN M. CLARK, PROJECT MANAGER

BAI GROUP, LLC.
2525 GREEN TECH DRIVE, SUITE D
STATE COLLEGE, PA 16803
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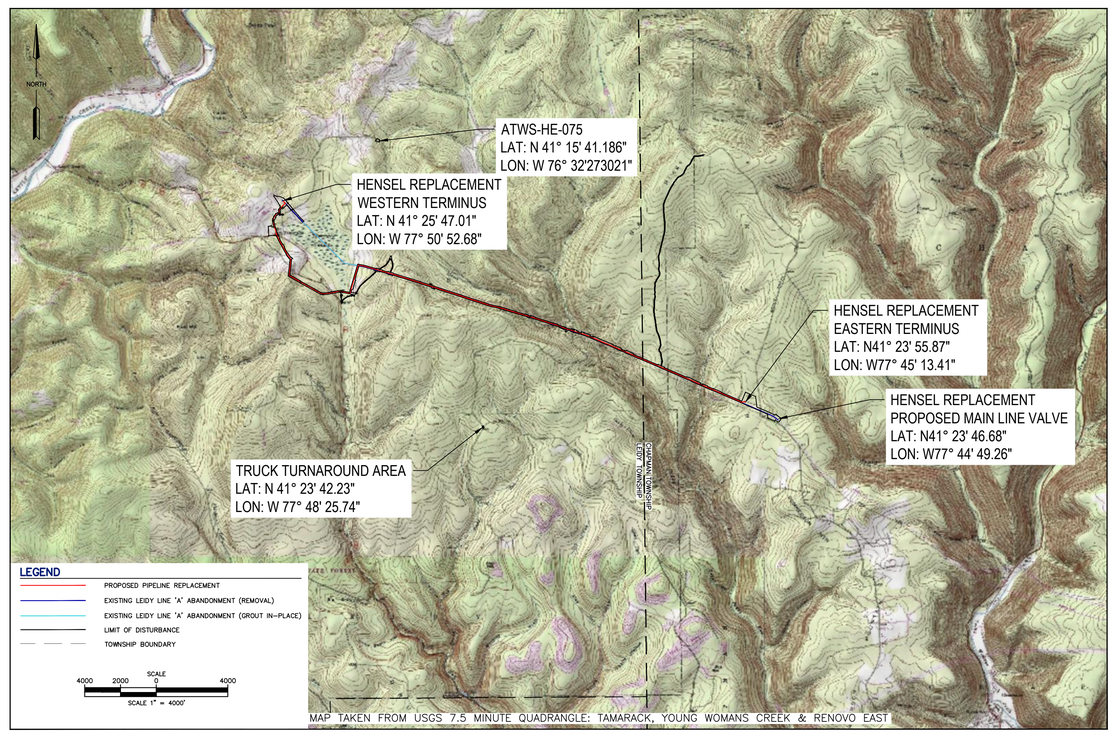
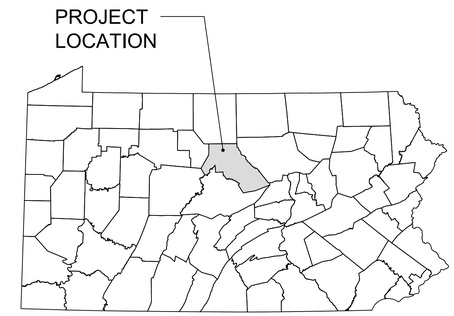
CONTACT: KEVIN C. CLARK, P.E.



LOCATION MAP



VICINITY MAP
N.T.S.

SHEET INDEX	
SHEET NUMBER	DRAWING TITLE
1 OF 8	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - COVER SHEET
2 OF 8	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - WESTERN TERMINUS MAIN LINE VALVES - EXISTING CONDITIONS PLAN
3 OF 8	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - WESTERN TERMINUS MAIN LINE VALVES - PROPOSED CONDITIONS PLAN
4 OF 8	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EASTERN TERMINUS MAIN LINE VALVES - EXISTING CONDITIONS PLAN
5 OF 8	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EASTERN TERMINUS MAIN LINE VALVES - PROPOSED CONDITIONS PLAN
6 OF 8	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - NOTES
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PROJECT DESCRIPTION

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC (TRANSCO), A SUBSIDIARY OF THE WILLIAMS COMPANIES, INC. IS PROPOSING THE LEIDY SOUTH PROJECT – HENSEL REPLACEMENT. THE HENSEL REPLACEMENT CONSISTS OF INSTALLING APPROXIMATELY 6.3 MILES OF 36–INCH PIPELINE LOOP ALONG TRANSCO'S LEIDY LINE IN LEIDY AND CHAPMAN TOWNSHIPS, CLINTON COUNTY. THIS PIPELINE WILL REPLACE THE CAPACITY OF A SEGMENT OF TRANSCO'S EXISTING 23.375–INCH LEIDY LINE A PIPELINE, AND THIS SEGMENT OF THE LEIDY LINE A PIPELINE TOTALING 5.8 MILES WILL BE ABANDONED AND REMOVED WITH THE EXCEPTION OF 0.8 MILE UNDER THE TAMARACK SWAMP NATURAL AREA, WHICH IS PROPOSED TO BE GROUTED IN–PLACE. ONCE PLACED INTO OPERATION, TRANSCO WILL REFER TO THE HENSEL REPLACEMENT AS THE LEIDY LINE D. TRANSCO WILL BE RELOCATING AND INSTALLING A MAINLINE VALVE (MLV) NEAR THE EASTERN TERMINUS OF THE HENSEL REPLACEMENT AS A MEANS TO ISOLATE GAS FLOWS ALONG SECTIONS OF A PIPELINE. AT THE WESTERN TERMINUS OF THE HENSEL REPLACEMENT AT AN EXISTING MLV, PIG TRAPS AND BLOCK VALVES WILL BE ADDED. CATHODIC PROTECTION CABLE WILL BE INSTALLED FROM PROPOSED MLV NEAR THE EASTERN TERMINUS TO MP 190.5, AND FROM THE WESTERN TERMINUS OF HENSEL REPLACEMENT TO THE TAMARACK SWAMP NATURAL AREA AND ASSOCIATED WETLANDS ON THE LEIDY LINE "A" AND "B" EXISTING RIGHT–OF–WAY. THE CATHODIC PROTECTION CABLE WILL BE INSTALLED IN THE SAME TRENCH AS THE PIPELINE WITHIN WETLAND, STREAM AND FLOODWAY CROSSINGS. THE HENSEL REPLACEMENT WILL INCLUDE THE CONSTRUCTION OF ONE TEMPORARY OFFLINE CONTRACTOR YARD. THE LIMIT OF DISTURBANCE (LOD) FOR THE HENSEL REPLACEMENT WILL BE APPROXIMATELY 135.2 ACRES.

Call before you dig.
1-800-242-1776 or 811

PENNSYLVANIA ACT 287 (1974) AS AMENDED BY PENNSYLVANIA LESS THAN THREE (3) WORKING DAYS AND NO MORE THAN (10) WORKING DAYS NOTICE TO UTILITIES BEFORE YOU EXCAVATE, DRILL, BLAST OR DEMOLISH.

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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
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PENNSYLVANIA PROFESSIONAL ENGINEER

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LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

COVER SHEET

LEIDY & CHAPMAN TOWNSHIPS, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: SWH	DATE: 3/22/19	ISSUED FOR BID:	SCALE: 1" = 4000'
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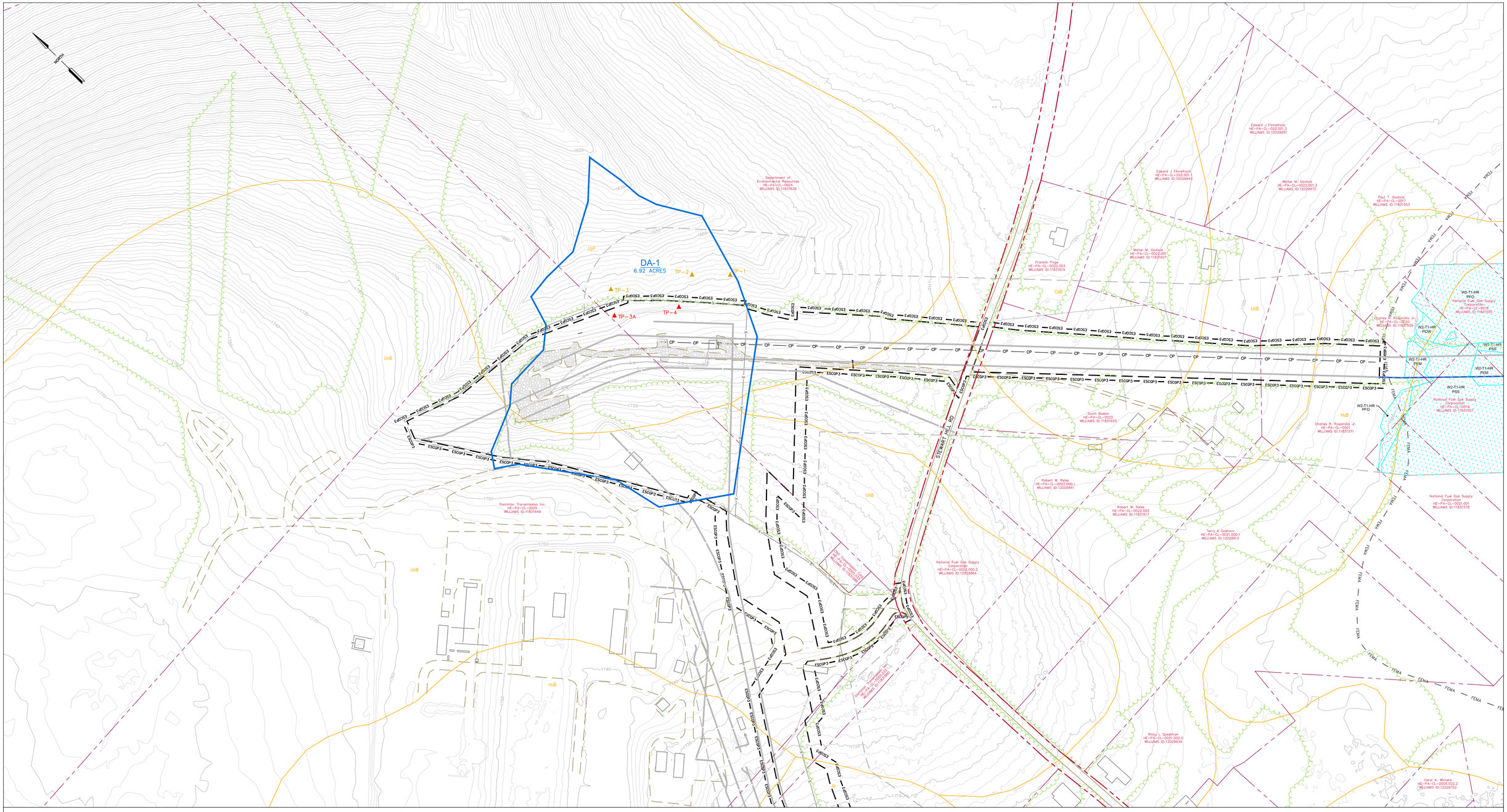

EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
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SOIL LEGEND

CaB	CALVN CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
UnB	UNGERS LOAM, 3 TO 8 PERCENT SLOPES
UpF	UNGERS-MECKESVILLE COMPLEX, 25 TO 50 PERCENT SLOPES, EXTREMELY STONY

LEGEND

- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- M/B2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE "A" ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE "A" ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- CP CATHODIC PROTECTION DEVICE
- PRE DEVELOPMENT DRAINAGE AREA
- TP-3 TEST PIT LOCATION (2019)
- TP-6 TEST PIT LOCATION (2020)

SCALE 1" =100'

KEVIN C. CLARK, P.E.

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LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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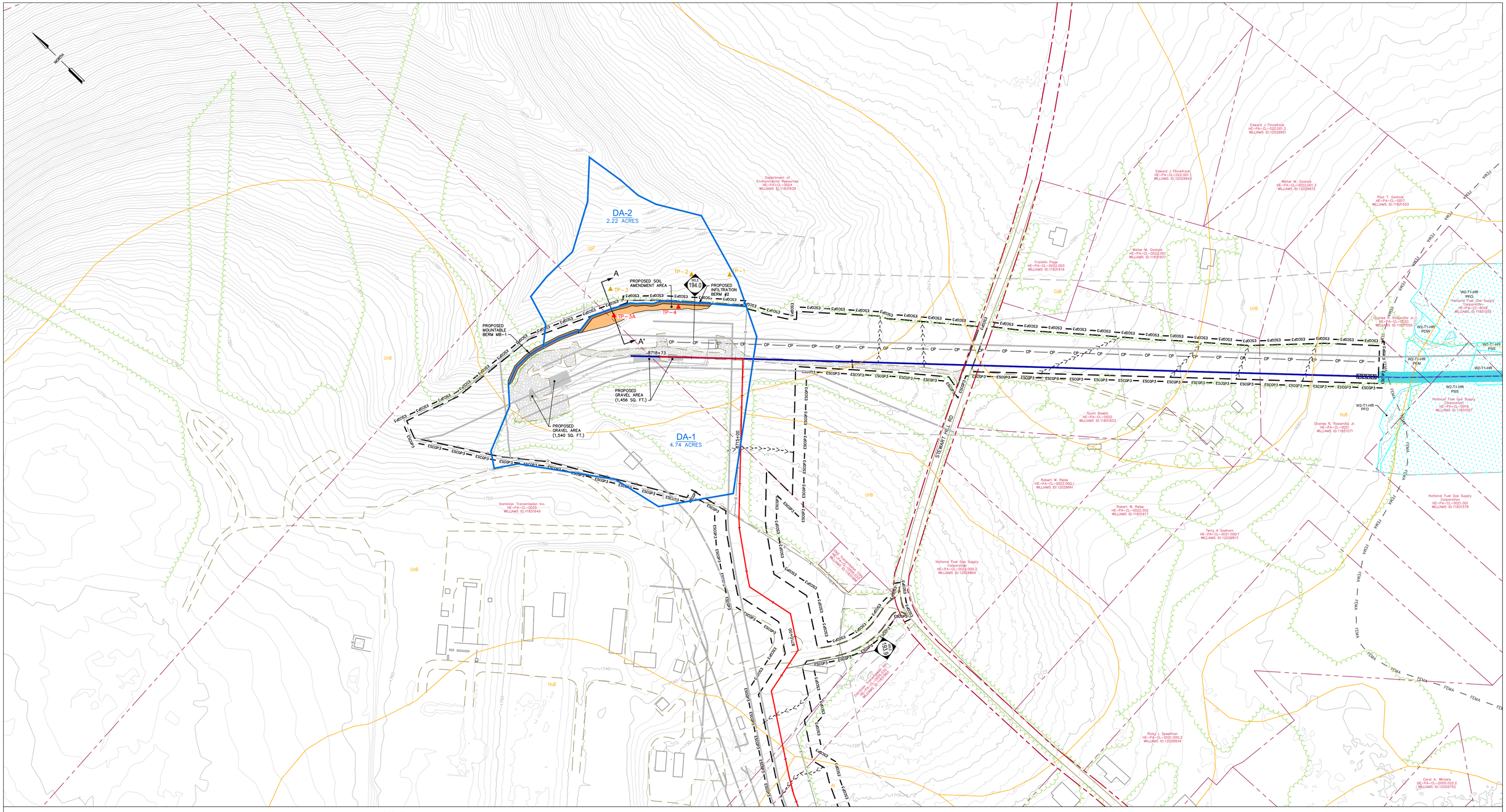

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- PROPOSED WATERBAR & OUTLET STRUCTURE
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- PROPOSED PIPELINE
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Williams.

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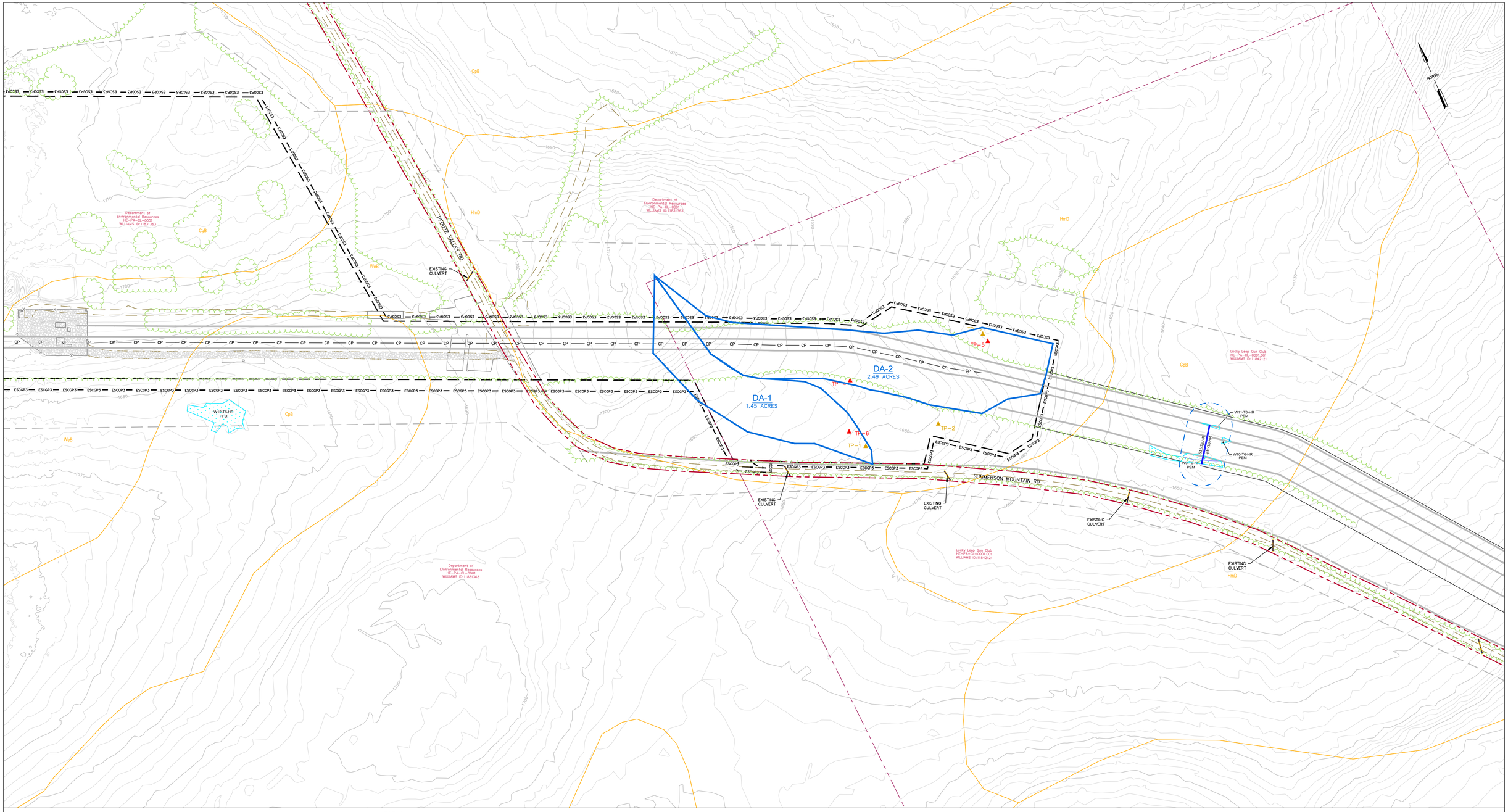

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SOIL LEGEND

CpB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

LEGEND

ESCGP3	ESCGP-3 PERMIT BOUNDARY		EXISTING UTILITY POLE / TOWER
	LIMITS OF DISTURBANCE	P	EXISTING UTILITY LINE
	APPROX. ENVIRONMENTAL STUDY LIMITS		EXISTING VALVE
	DELINEATED WETLAND		EXISTING CULVERT
	DELINEATED WATERWAY / STREAM (TOP OF BANK)	X	EXISTING FENCE
	STREAM FLOW DIRECTION		EXISTING STRUCTURE
	RIPARIAN BUFFER		EXISTING ROAD (GRAVEL)
	50'/FEMA FLOODWAY		EXISTING ROAD (PAVED)
FEMA	FEMA 100-YEAR FLOODPLAIN		EXISTING GRAVEL AREAS
MrB2	SOIL BOUNDARY / TYPE	1250	EXISTING GRADE MAJOR CONTOURS (2' C.I.)
	EXISTING TREELINE / TREE/SHRUB	1244	EXISTING GRADE MINOR CONTOURS (10' C.I.)
	PROPERTY LINE	CP	CATHODIC PROTECTION DEVICE
	EXISTING LEIDY / TGPL PIPELINES		PRE DEVELOPMENT DRAINAGE AREA
	EXISTING LEIDY LINE "A" ABANDONMENT (REMOVAL)	TP-3	TEST PIT LOCATION (2019)
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	EXISTING FOREIGN PIPELINES		

SCALE
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SCALE 1" =100'

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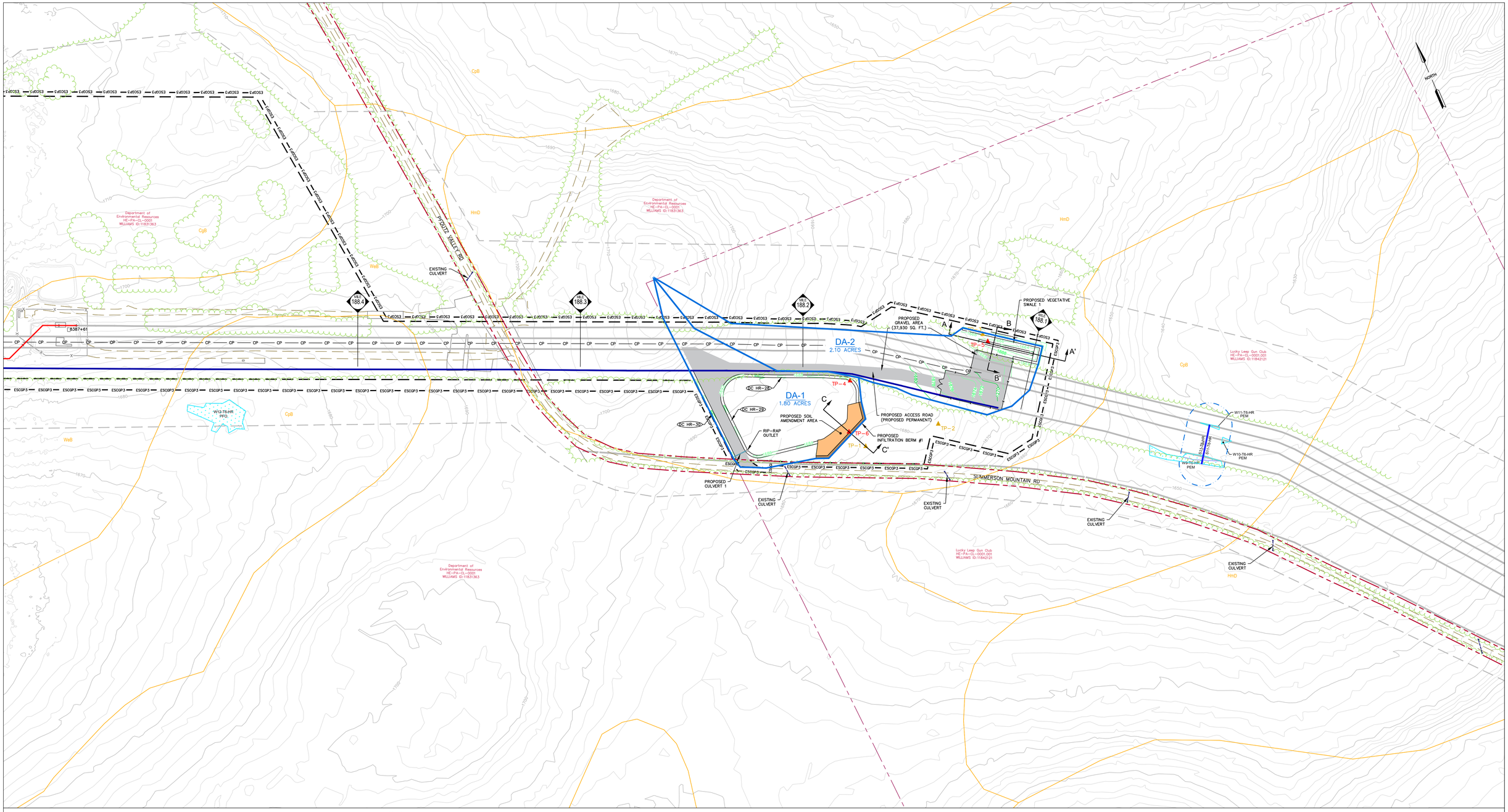

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LEGEND

- PROPOSED WATERBAR & OUTLET STRUCTURE
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PROPOSED SITE CONDITIONS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: SWH	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 5 OF 8

RESOLUTION TO SOIL LIMITATIONS

TRANSCO PROPOSES THE FOLLOWING RESOLUTIONS TO COMPENSATE FOR SOIL LIMITATIONS SUMMARIZED IN TABLE 3 ABOVE:

1. TO OFFSET THE CAVING OF CUTBANKS, TRENCHING OPERATIONS WILL BE CONDUCTED IN ACCORDANCE WITH THE OSHA TECHNICAL MANUAL FOR TRENCHING.
2. PREVENTATIVE COATINGS SHALL BE USED TO PREVENT CORROSION OF CONCRETE AND/ OR STEEL.
3. WHEN BEDROCK IS ENCOUNTERED IT WILL BE REMOVED BY MECHANICAL METHODS OR BLASTING. BLASTING WILL CONFORM WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.
4. PRECAUTIONS WILL BE TAKEN TO PREVENT SLOPE FAILURE WHEN WORKING WITHIN LOW STRENGTH SOILS BY FLATTENING CUT / FILL SLOPES, NOT OVERLOADING, MAINTAINING LATERAL SUPPORT, AND PREVENTING SATURATION OF SOILS. USE OF THESE SOILS WILL BE AVOIDED FOR ROADWAY CONSTRUCTION.
5. FOR SOILS PRONE TO FLOODING, SLOW PERCOLATION, PONDING WETNESS, HAVE A SEASONAL HIGH WATER TABLE, OR ARE HYDRIC, EXCAVATIONS IN SOILS THAT HAVE THESE CHARACTERISTICS WILL LIKELY ENCOUNTER WATER, DEWATER WITH APPROPRIATE MEANS SUCH AS PUMP WATER FILTER BAGS, SEDIMENT TRAPS, ETC.
6. SOILS THAT HAVE THE POTENTIAL TO SWELL, SHRINK, OR HEAVE DUE TO FROST ACTION MAY CAUSE DAMAGE TO ROADWAYS OR PADS WHERE FOUNDATIONS ARE CRITICAL REMOVAL AND REPLACEMENT OF SOILS WITH SUITABLE MATERIAL MAY BE REQUIRED.
7. IN SOILS THAT ARE A POOR SOURCE OF TOPSOIL, DROUGHTY OR PRONE TO WETNESS, SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL, WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.
8. FOR THOSE SOILS THAT ARE EASILY ERODIBLE, PROVIDE PROTECTIVE LINING, SEEDING AND MULCHING, EROSION CONTROL BLANKETS (ROLLS OR HYDRAULICALLY APPLIED), TRACKING SLOPES, UPSTREAM DIVERSIONS, WATERBARS, ETC., TO MINIMIZE EROSION OF THE SOILS.

Table 2 – Soils mapping units within the LOD

Soil Mapping Unit	Soil Series
Eastern Terminus Main Line Valve and Access Road	
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony
Western Terminus Main Line Valve	
UpF	Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE \STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK-SWELL
Clymer	CgB, HmD	X	C	X	X			X	X	X	X	X	X	
Cookport	CgB, CpB	X	C/S	X	X		X	X	X	X	X	X	X	
Hazleton	HmD	X	C	X	X			X	X	X	X	X	X	
Wharton	WeB	X	C/S		X		X	X	X	X	X	X	X	X
Ungers	UpF	X	C		X				X	X			X	

CHARACTERIZATIONS OF EARTH DISTURBANCE ACTIVITIES, INCLUDING PAST, PRESENT AND PROPOSED LAND USES

TRANSCO WILL BE RELOCATING AND INSTALLING A MAINLINE VALVE (MLV) NEAR THE EASTERN TERMINUS AS A MEANS TO ISOLATE GAS FLOWS. PIG LAUNCHERS/RECEIVERS WILL BE LOCATED AT THIS MLV FACILITY. AT THE WESTERN TERMINUS, AT AN EXISTING MLV, PIG TRAPS AND BLOCK VALVES WILL BE ADDED. ALL WORK AND DISTURBED AREAS ARE LOCATED WITHIN TRANSCO PROPERTY, EXISTING EASEMENTS, OR LEGALLY OBTAINED WORKSPACE WHERE THE PAST, PRESENT, AND PROPOSED LAND USE IS PRIMARILY AN EXISTING PIPELINE ROW. ALL DISTURBED AREAS WITHIN THE TEMPORARY WORKSPACES WILL BE RESTORED TO THE ORIGINAL CONTOURS. USING DATA TAKEN FROM GOOGLE EARTH AND MULTI-RESOLUTION LAND CHARACTERISTICS (MRLC) CONSORTIUM WEBSITE (HTTPS: //WWW.MRLC.GOV/VIEWER/), MAJOR PORTION OF THE EASTERN AND WESTERN TERMINUS SITES WERE EXISTING AND MAINTAINED GAS PIPELINE RIGHT-OF-WAY FOR THE PAST 20 YEARS AND WILL CONTINUE TO BE AN EXISTING AND MAINTAINED GAS PIPELINE RIGHT-OF-WAY ONCE THE PROJECT IS COMPLETE. ALONG THE EDGES OF THE ROW LAND USE IS PRIMARILY FORESTED. BASED ON THE SURROUNDING LAND CHARACTERISTICS, LAND USE PRIOR TO ROW CONSTRUCTION WITHIN THE PAST 50 YEARS WOULD HAVE BEEN EITHER FORESTED LAND OR MEADOW. THE PROPOSED CONSTRUCTION AT BOTH SITES WILL CONSIST OF GRAVEL PADS AND AN ADDITIONAL ACCESS ROAD WILL BE CONSTRUCTED AT EASTERN TERMINUS MLV SITE. THE CONTRACTOR WILL CONSTRUCT STORMWATER BMPS TO MITIGATE THE INCREASE IN VOLUME AND PEAK RATES ASSOCIATED WITH CONSTRUCTION. THE PROPOSED BMPS ARE DESIGNED TO EVAPORATE AND INFILTRATE THE NET INCREASE IN VOLUME BETWEEN THE PRE- AND POST-DEVELOPMENT 2-YEAR RAIN EVENTS.

EASTERN TERMINUS MAIN LINE VALVE AND ACCESS ROAD

A VEGETATED SWALE AND AN INFILTRATION BERM WITH SOIL AMENDMENT WILL BE USED TO ATTENUATE AND INFILTRATE RUNOFF FROM IMPERVIOUS AREAS, SIMULTANEOUSLY ALLOWING SOME POLLUTANTS TO SETTLE OUT IN THE PROCESS. THREE VEGETATED DIVERSION CHANNELS CONSTRUCTED ALONG THE EDGES OF THE ACCESS ROAD WILL DIVERT RUNOFF TO THE SWALE AND INFILTRATION BERM AREAS.

BMP INSTALLATION SEQUENCE

THE PCSM BMPS SHOULD BE INSTALLED IN A MANNER DESIGNED TO:

1. PROTECT BMP AREAS ASSOCIATED WITH INFILTRATION FROM COMPACTION PRIOR TO AND DURING INSTALLATION.
2. MAINTAIN PROPER EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION.
3. AS AREAS ARE COMPLETED, SEED AND MULCH IN ACCORDANCE WITH THE SECTION BELOW.
4. DO NOT REMOVE EROSION AND SEDIMENT CONTROL MEASURES UNTIL SITE IS FULLY STABILIZED.
5. INSTALL BMPS AS FOLLOWS:

DIVERSION CHANNELS

A. CONSTRUCT DIVERSION CHANNELS AS SHOWN IN THE PLAN.
B. STABILIZE THE CHANNELS WITH SPECIFIED CHANNEL LININGS.

VEGETATED SWALE

A. CONSTRUCT AND STABILIZE THE SWALE EARLY IN THE CONSTRUCTION SCHEDULE, PREFERABLY BEFORE MASS EARTHWORK AND PAVING INCREASE THE RATE AND VOLUME OF RUNOFF.
B. ROUGH GRADE THE VEGETATED SWALE. AVOID EXCESSIVE COMPACTION AND/OR LAND DISTURBANCE.
C. AS NEEDED, REMOVE UNSUITABLE SOIL (CLAYEY, ROCKY, COARSE SANDS, ETC.) TO SUPPORT DENSE VEGETATION, REPLACING WITH APPROXIMATELY 12 INCHES OF LOAMY OR SANDY SOILS. ALKALINE SOILS ARE RECOMMENDED TO FURTHER REDUCE AND RETAIN METALS.
D. INSTALL OUTLET CONTROL STRUCTURE.
E. FINAL GRADE THE SWALE TO ENSURE ACCURACY.
F. SEED AND STABILIZE AS SOON AS POSSIBLE.
   a. SELECT DENSE AND DIVERSE CLOSE-GROWING, WATER-RESISTANT PLANTS WHOSE GROWING SEASON CORRESPONDS TO THE WET SEASON.
   b. VEGETATION SHOULD BE SELECTED AT AN EARLY STAGE IN THE DESIGN PROCESS, WITH WELL-DEFINED POLLUTION CONTROL GOALS IN MIND.
   c. SELECTED VEGETATION MUST BE ABLE TO THRIVE AT THE SPECIFIC SITE AND THE USE OF NATIVE PLANT SPECIES IS STRONGLY ADVISED, AS IS THE AVOIDANCE OF INVASIVE PLANT SPECIES.
   d. SWALE VEGETATION MUST ALSO BE SALT TOLERANT, AS THE PAVED ROADWAY WILL UNDERGO WINTER ROAD MAINTENANCE ACTIVITIES THAT WILL CONTRIBUTE TO SALT/CHLORIDES.
   e. THE SWALE IS PARTICULARLY VULNERABLE TO SCOUR AND EROSION PRIOR TO THE ESTABLISHMENT OF VEGETATION. PROTECT THE SEED BED WITH TEMPORARY EROSION CONTROL, SUCH AS STRAW MATTING, COMPOST BLANKETS, OR CURLED WOOD BLANKETS.

INFILTRATION BERM & SOIL AMENDMENT

A. ALL CONSTRUCTION SHOULD BE COMPLETED AND STABILIZED BEFORE BEGINNING SOIL RESTORATION.
B. SOIL AMENDMENT SHOULD ONLY BE PERFORMED WHEN THE SOIL CONDITIONS ARE DRY AND SHOULD ONLY USE A SOLID SHANK RIPPER, NOT A DISK OR PLOW DUE TO THEIR INEFFECTIVENESS.
C. TILL SOIL BY DIGGING, SCRAPING, AND MIXING OF SOIL TO CIRCULATE AIR INTO THE SOIL MANTLE IN VARIOUS LAYERS. IF COMPACTION OCCURS DOWN TO 20 INCHES BELOW GRADE, RIPPING OF SOIL IS LIKELY NEEDED.
D. IF NECESSARY, ADD COMPOST OR OTHER SUITABLE MATERIAL TO INCREASE WATER HOLDING AND RETENTION CAPACITY AT THE RATIO OF 2:1 (SOIL: COMPOST).
E. SOIL AMENDMENT AND RESTORATION SHOULD NOT TAKE PLACE WITHIN THE DRIP LINE OF TREES OR TREE LINE TO AVOID DAMAGING ROOT SYSTEM AND SHOULD NOT TAKE PLACE OVER UTILITY INSTALLATIONS WITHIN 30 INCHES OF THE SURFACE.
F. CONSTRUCT THE INFILTRATION BERM AS SHOWN ON THE PLAN. AVOID EXCESSIVE COMPACTION AND/OR LAND DISTURBANCE. SEED AND STABILIZE AS SOON AS POSSIBLE.

6. ANY SEDIMENT THAT ENTERS BMPS DURING CONSTRUCTION IS TO BE REMOVED WITHIN 24 HOURS.
7. SEED AND STABILIZE REMAINING TOPSOIL AS PER SEEDING AND MULCHING SECTION BELOW.
8. FOLLOW LONG TERM OPERATION AND MAINTENANCE GUIDELINES DISCUSSED BELOW.

PCSM CRITICAL STAGES

CRITICAL POINTS REQUIRING VISITS BY THE LICENSED PROFESSIONAL OR DELEGATE ARE AS FOLLOWS:

1. FOR THE FINAL GRADING OF THE ACCESS ROAD, ENSURING IT IS CONSTRUCTED ACCORDING TO THE PLAN DETAILS FOR PROPER CONVEYANCE OF RUNOFF.
2. FOLLOWING FINAL GRADING AND SEEDING OF THE DIVERSION CHANNELS, VEGETATED SWALE AND INFILTRATION BERM, IN ORDER TO CONFIRM THEY HAVE BEEN CONSTRUCTED ACCORDING TO THE PLAN DETAILS FOR PROPER COLLECTION, INFILTRATION, AND CONVEYANCE OF RUNOFF. PERIODIC ASSESSMENTS WILL NEED TO BE MADE TO ENSURE ACCUMULATED SEDIMENT HAVE BEEN CLEANED OUT SO THE SWALE MAINTAINS THE NECESSARY DESIGN VOLUMES.
3. FOR THE INSPECTION OF AMENDED SOIL TO ENSURE SUFFICIENT INFILTRATION OCCURS BEHIND THE BERM
4. DURING THE LAYOUT AND EXCAVATION OF THE OUTLET PIPE, THE PROFESSIONAL OR DELEGATE WILL ENSURE SIZING, MATERIALS SPECIFICATIONS, AND CONSTRUCTION PROCEDURES ARE FOLLOWED TO ENABLE PROPER STORAGE IN THE SWALE AND DISCHARGE TO THE POND.
5. FOR FINAL INSPECTION OF CONSTRUCTED SWALE AND INFILTRATION BERM
6. AT THE ESTABLISHMENT OF HARD SURFACE STABILIZATION OR 70% VEGETATION COVERS TO ALLOW REMOVAL OF E&S CONTROLS.

HENSEL WESTERN TERMINUS MAIN LINE VALVE

BMP INSTALLATION SEQUENCE

THE PCSM BMPS SHOULD BE INSTALLED IN A MANNER DESIGNED TO:

1. PROTECT BMP AREAS ASSOCIATED WITH INFILTRATION FROM COMPACTION PRIOR TO AND DURING INSTALLATION.
2. MAINTAIN PROPER EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTIO
3. AS AREAS ARE COMPLETED, SEED AND MULCH IN ACCORDANCE WITH THE SECTION BELOW.
4. DO NOT REMOVE EROSION AND SEDIMENT CONTROL MEASURES UNTIL SITE IS FULLY STABILIZED.
5. INSTALL BMPS AS FOLLOWS:

- INSTALL MOUNTABLE BERMS/DIVERSION CHANNELS AS SHOWN ON THE PLAN.
- CONSTRUCT THE INFILTRATION BERM AS SHOWN ON THE PLAN. AVOID EXCESSIVE COMPACTION AND/OR LAND DISTURBANCE. SEED AND STABILIZE AS SOON AS POSSIBLE.

SOIL AMENDMENT

A. ALL CONSTRUCTION SHOULD BE COMPLETED AND STABILIZED BEFORE BEGINNING SOIL RESTORATION.
B. SOIL AMENDMENT SHOULD ONLY BE PERFORMED WHEN THE SOIL CONDITIONS ARE DRY AND SHOULD ONLY USE A SOLID SHANK RIPPER, NOT A DISK OR PLOW DUE TO THEIR INEFFECTIVENESS.
C. TILL SOIL BY DIGGING, SCRAPING, AND MIXING OF SOIL TO CIRCULATE AIR INTO THE SOIL MANTLE IN VARIOUS LAYERS. IF COMPACTION OCCURS DOWN TO 20 INCHES BELOW GRADE, RIPPING OF SOIL IS LIKELY NEEDED.
D. IF NECESSARY, ADD COMPOST OR OTHER SUITABLE MATERIAL TO INCREASE WATER HOLDING AND RETENTION CAPACITY AT THE RATIO OF 2:1 (SOIL: COMPOST).
E. SOIL AMENDMENT AND RESTORATION SHOULD NOT TAKE PLACE WITHIN THE DRIP LINE OF TREES OR TREE LINE TO AVOID DAMAGING ROOT SYSTEM AND SHOULD NOT TAKE PLACE OVER UTILITY INSTALLATIONS WITHIN 30 INCHES OF THE SURFACE.

SEEDING AND MULCHING:

THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER CONSTRUCTION IS COMPLETED. ESTABLISHMENT OF TEMPORARY COVER MUST TAKE PLACE WITHIN 4 DAYS OF CESSATION OF WORK. TEMPORARY EROSION AND SEDIMENTATION CONTROL BMPS CAN BE REMOVED WHEN THE SITE MEETS FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL-DISTURBING ACTIVITIES ARE COMPLETED, AND THAT A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT HARD COVER SUCH AS PAVEMENT OR BUILDINGS HAS STABILIZED THE SURFACE. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE. NO HAY OR STRAW MULCH SHALL BE PLACED ON WATERBODY BANKS. AT A MINIMUM, ALL WATERBODY BANKS SHALL BE COVERED WITH EROSION CONTROL BLANKET. IN ADDITION, ONLY STRAW MULCH SHALL BE USED IN AREAS ADJACENT TO WETLANDS.

TEMPORARY REVEGETATION

AFTER GRADING AND EXCAVATION IS COMPLETED WITHIN AN AREA, VEGETATION WILL BE SOWN PROMPTLY AFTER CEASING EARTHWORK IN THOSE AREAS. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL WILL BE APPLIED TO NEWLY SEEDED AREAS TO PROTECT AGAINST EROSION UNTIL THE VEGETATION IS ESTABLISHED. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL SHALL BE APPLIED AT A RATE OF AT LEAST 3 TONS PER ACRE. EROSION CONTROL BLANKET SHALL BE USED ON STREAM BANKS. NO HAY OR STRAW, MULCH OR BLANKET SHALL BE UTILIZED IN WETLAND AREAS.

PERMANENT SEEDING AND MULCHING

TOPSOIL WILL BE REPLACED PRIOR TO STABILIZATION. DISTURBED AREAS SHALL BE SEEDED WITH A MIXTURE AS OUTLINED IN THE DETAILS PAGES OF THE EROSION AND SEDIMENT CONTROL PLAN SET. APPLY LIME AND FERTILIZER IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS OR AS OUTLINED IN THE BELOW TABLE. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL SHALL BE APPLIED AT A RATE OF AT LEAST 3 TONS PER ACRE.

TABLE 11.2
Soil Amendment Application Rate Equivalents

Soil Amendment	Permanent Seeding Application Rate: Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	Notes
Agricultural lime	6 tons	240 lb.	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-20-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields
	Temporary Seeding Application Rate			
Agricultural lime	1 ton	40 lb.	410 lb.	Typically not required for topsoil stockpiles
10-10-10 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for topsoil stockpiles

Adapted from Penn State, "Erosion Control and Conservation Plantings on Noncropland"

NOTE: A compost blanket which meets the standards of this chapter may be substituted for the soil amendments shown in Table 11.2.

TABLE 11.4
Recommended Seed Mixtures

Mixture Number	Species	Seeding Rate - Pure Live Seed [1]: Most Sites	Adverse Sites
1 [2]	Spring oats (spring), or Annual ryegrass (spring or fall), or Winter wheat (fall), or Winter rye (fall)	64 10 90 56	96 15 120 112
2 [3]	Tall fescue, or Fine fescue, or Kentucky bluegrass, plus Redtop[4], or Perennial ryegrass	60 35 25 3 15	75 40 30 3 20
3	Birdsfoot trefoil, plus Tall fescue	6 30	10 35
4	Birdsfoot trefoil, plus Reed canarygrass	6 10	10 15
8	Flatpea, plus Tall fescue, or Perennial ryegrass	20 20 20	30 30 25
9 [6]	Serecia lespedeza, plus Tall fescue, plus Redtop[4]	10 20 3	20 25 3
10	Tall fescue, plus Fine fescue	40 10	60 15
11	Deertongue, plus Birdsfoot trefoil	15 6	20 10
12 [7]	Switchgrass, or Big Bluestem, plus Birdsfoot trefoil	15 15 6	20 20 10
13	Orchardgrass, or Smooth bromegrass, plus Birdsfoot trefoil	20 25 6	30 35 10

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. PLS is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds PLS shown on the seed tag. Thus, if the PLS content of a given seed lot is 35%, divide 12 PLS by 0.35 to obtain 34.3 pounds of seed required to plant one acre. All mixtures in this table are shown in terms of PLS.
2. If high-quality seed is used, for most sites seed spring oats at a rate of 2 bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at 1 bushel per acre. If germination is below 90%, increase these suggested seeding rates by 0.5 bushel per acre.
3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.
4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.
5. Use for highway slopes and similar sites where the desired species after establishment is crownvetch.
6. Use only in extreme southeastern or extreme southwestern Pennsylvania. *Serecia lespedeza* is not well adapted to most of PA.
7. Do not mow shorter than 9 to 10 inches.
8. Seed mixtures containing crown vetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

TABLE 11.5
Recommended Seed Mixtures for Stabilizing Disturbed Areas

Site Condition	Nurse Crop	Seed Mixture (Select one mixture)
Slopes and Banks (not mowed)		
Well-drained	1 plus	3, 8, or 12[1]
Variable drainage	1 plus	3
Slopes and Banks (mowed)		
Well-drained	1 plus	2 or 10
Slopes and Banks (grazed/hay)		
Well-drained	1 plus	2, 3, or 13
Gullies and Eroded Areas	1 plus	3, or 12[1]
Erosion Control Facilities (BMPs)		
Sod waterways, spillways, frequent water flow areas	1 plus	2, 3, or 4
Drainage ditches		
Shallow, less than 3 feet deep	1 plus	2, 3, or 4
Deep, not mowed	1 plus	
Pond banks, dikes, levees, dams, diversion channels, And occasional water flow areas		
Mowed areas	1 plus	2 or 3
Non-mowed areas	1 plus	
For hay or silage on diversion channels and occasional water flow areas	1 plus	3 or 13
Highways [2]		
Non-mowed areas		
Well-drained	1 plus	8, 9, or 10
Variable drained	1 plus	3
Poorly drained	1 plus	3 or 4
Areas mowed several times per year	1 plus	2, 3, or 10
Utility Right-of-way		
Well-drained	1 plus	8, or 12[1]
Variable drained	1 plus	3
Well-drained areas for grazing/hay	1 plus	2, 3, or 13
Effluent Disposal Areas	1 plus	3 or 4
Sanitary Landfills	1 plus	3, 5, 11[1], or 12[1]
Surface mines		
Spoils, mine wastes, fly ash, slag, settling basin		
Residues and other severely disturbed areas (lime to soil test)	1 plus	3, 4, 8, 9, 11[1], or 12[1]
Severely disturbed areas for grazing/hay	1 plus	3 or 13

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.
2. Contact the Pennsylvania Department of Transportation district roadside specialist for specific suggestions on treatment techniques and management practices.
3. Seed mixtures containing crown vetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

LONG TERM OPERATION AND MAINTENANCE SCHEDULE (NOI CHECKLIST ITEM 7.J)

ALL BMPS SHOULD BE PROPERLY MAINTAINED TO ENSURE THEIR EFFECTIVENESS. SHEET FLOW CONDITIONS AND INFILTRATION MUST BE SUSTAINED THROUGHOUT THE LIFE OF THE BMP. INSPECT BMPS FOR CLOGGING FROM SEDIMENT OF DEBRIS, DAMAGE BY FOOT OR VEHICULAR TRAFFIC, AND FLOW CHANNELIZATION. INSPECTIONS SHOULD BE MADE ON A QUARTERLY BASIS FOR THE FIRST TWO YEARS FOLLOWING INSTALLATION, AND THEN TWICE PER YEAR THEREAFTER. INSPECTIONS SHOULD ALSO BE MADE AFTER EVERY STORM EVENT GREATER THAN 1 INCH DURING THE ESTABLISHMENT PERIOD.

OPERATION AND MAINTENANCE GUIDELINES SHOULD BE PROVIDED TO ALL FACILITY OWNERS AND TENANTS. SEDIMENT AND DEBRIS SHOULD BE ROUTINELY REMOVED UPON OBSERVATION. IF EROSION IS OBSERVED, MEASURES SHOULD BE TAKEN TO IMPROVE DISPERSION METHOD TO ADDRESS THE SOURCE OF EROSION. SEDIMENT SHOULD BE REMOVED WHEN THE BMP IS THOROUGHLY DRY. TRASH AND DEBRIS REMOVED FROM THE SITE SHOULD BE DEPOSITED ONLY AT SUITABLE DISPOSAL/RECYCLING SITES AND MUST COMPLY WITH APPLICABLE LOCAL, STATE, AND FEDERAL WASTE REGULATIONS. GRASS COVER SHOULD BE MOWED WITH LOW GROUND PRESSURE EQUIPMENT AS NEEDED TO CONTROL NOXIOUS WEEDS. MOWING SHOULD BE DONE ONLY WHEN THE SOIL IS DRY IN ORDER TO PREVENT TRACKING DAMAGE TO VEGETATION, SOIL COMPACTION, AND FLOW CONCENTRATIONS. IF VEGETATIVE COVER IS NOT FULLY ESTABLISHED WITHIN THE DESIGNATED TIME, IT SHOULD BE REPLACED WITH AN ALTERNATIVE SPECIES. UNWANTED OR INVASIVE GROWTH SHOULD BE REMOVED ON AN ANNUAL BASIS.

MAINTENANCE ACTIVITES ON THE VEGETATED SWALES SHOULD BE DONE ANNUALLY AND WITHIN 48 HOURS AFTER EVERY MAJOR STORM EVENT (> 1-INCH RAINFALL DEPTH). EROSION PROBLEMS, DAMAGE TO VEGETATION, SEDIMENT AND DEBRIS ACCUMULATION, UNIFORMLY OF IN CROSS-SECTION AND POOLS OF STANDING WATER SHOULD BE INSPECTED.

CHANNEL LININGS WILL BE INSPECTED FOR SIGNS OF EROSION OR DISLODGING, AS APPLICABLE. CHANNELS WILL BE INSPECTED FOR DEBRIS, OVERGROWN VEGETATION, AND OTHER BLOCKAGES. VEGETATED AREAS WILL BE INSPECTED WEEKLY AND AFTER RUNOFF EVENTS UNTIL PERMANENT VEGETATION IS ACHIEVED. ONCE THE VEGETATION IS ESTABLISHED, INSPECTIONS OF HEALTH, DIVERSITY, AND DENSITY SHOULD BE PERFORMED AT LEAST TWICE PER YEAR, DURING BOTH THE GROWING AND NON-GROWING SEASON. VEGETATIVE COVER SHOULD BE SUSTAINED AT 85% AND REESTABLISHED IF DAMAGE GREATER THAN 50% IS OBSERVED. DAMAGED BMPS WILL BE REPAIRED AS SOON AS POSSIBLE UPON DISCOVERY. REPAIRS WILL BE MADE TO RESTORE TO BMPS TO THE ORIGINAL DESIGN CONDITION.

MATERIAL RECYCLING AND DISPOSAL

IF THE SITE WILL NEED TO HAVE FILL IMPORTED FROM AN OFF-SITE LOCATION, THE RESPONSIBILITY FOR PERFORMING ENVIRONMENTAL DUE DILIGENCE AND THE DETERMINATION OF CLEAN FILL WILL IN MOST CASES RESIDE WITH THE OPERATOR.

IF THE SITE WILL HAVE EXCESS FILL THAT WILL NEED TO BE EXPORTED TO AN OFF-SITE LOCATION, THE RESPONSIBILITY OF CLEAN FILL DETERMINATION AND ENVIRONMENTAL DUE DILIGENCE RESTS ON THE APPLICANT.

IF ALL CUT AND FILL MATERIALS WILL BE USED ON THE SITE, A CLEAN FILL DETERMINATION IS NOT REQUIRED BY THE OPERATOR UNLESS THERE IS A BELIEF THAT A SPILL OR RELEASE OF A REGULATED SUBSTANCE OCCURRED ON SITE.

APPLICANTS AND/OR OPERATORS MUST USE ENVIRONMENTAL DUE DILIGENCE TO ENSURE THAT THE FILL MATERIAL ASSOCIATED WITH THIS PROJECT QUALIFIES AS CLEAN FILL. DEFINITIONS OF CLEAN FILL AND ENVIRONMENTAL DUE DILIGENCE ARE PROVIDED BELOW. ALL FILL MATERIAL MUST BE USED IN ACCORDANCE WITH THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL", DOCUMENT NUMBER 258 2182 773. A COPY OF THIS POLICY IS AVAILABLE ONLINE AT WWW.DEPWEB.STATE.PA.US.

CLEAN FILL IS DEFINED AS: UNCONTAMINATED, NON-WATER SOLUBLE, NON-DECOMPOSABLE, INERT, SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED. (THE TERM "USED ASPHALT" DOES NOT INCLUDE MILLED ASPHALT OR ASPHALT THAT HAS BEEN PROCESSED FOR RE-USE.).

ENVIRONMENTAL DUE DILIGENCE: INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF PROPERTY OWNERSHIP, REVIEW OF PROPERTY USE HISTORY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS. ANALYTICAL TESTING IS NOT A REQUIRED PART OF DUE DILIGENCE UNLESS VISUAL INSPECTION AND/OR REVIEW OF THE PAST LAND USE OF THE PROPERTY INDICATES THAT THE FILL MAY HAVE BEEN SUBJECTED TO A SPILL OR RELEASE OF REGULATED SUBSTANCE. IF THE FILL MAY HAVE BEEN AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE, IT MUST BE TESTED TO DETERMINE IF IT QUALIFIES AS CLEAN FILL. TESTING SHOULD BE PERFORMED IN ACCORDANCE WITH APPENDIX A OF THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL".

FILL MATERIAL THAT DOES NOT QUALIFY AS CLEAN FILL IS REGULATED FILL. REGULATED FILL IS WASTE AND MUST BE MANAGED IN ACCORDANCE WITH THE DEPARTMENT'S MUNICIPAL OR RESIDUAL WASTE REGULATIONS BASED ON 25 PA. CODE CHAPTERS 287 RESIDUAL WASTE MANAGEMENT OR 271 MUNICIPAL WASTE MANAGEMENT, WHICHEVER IS APPLICABLE.

THERMAL IMPACTS

DUE TO THE OVERALL NATURE OF THE PROJECT, THERMAL IMPACTS TO SURFACE WATERS ARE NOT ANTICIPATED. THE PIPELINE INSTALLATION ACTIVITIES WILL PRIMARILY TAKE PLACE WITHIN AN EXISTING CLEARED AND MAINTAINED PIPELINE RIGHT-OF-WAY. THERE WILL BE NO INCREASE IN STORMWATER DISCHARGE. THE PRIMARY MEANS TO ADDRESS THERMAL IMPACTS ON THIS PROJECT IS TO LIMIT THE SIZE AND DURATION OF EXPOSED EARTH. REVEGETATION PROCEDURES AND THE SEQUENCE OF CONSTRUCTION OUTLINE DISTURBED AREAS BEING IMMEDIATELY REVEGETATED.

STORMWATER RUNOFF ASSOCIATED WITH THE INSTALLATION OF THE MLV'S WILL BE ROUTED THROUGH THE STORMWATER BMP'S DESIGNED TO RETAIN AND INFILTRATE THE FIRST SURGE OF WATER FROM THE SITE. THE FIRST SURGE OF WATER WILL BE THE WARMEST WATER FOR THE DURATION OF THE STORM EVENT AND WILL QUICKLY COOL AS THE STORM EVENT PROGRESSES. THE BMPS ARE DESIGNED TO CAPTURE AND INFILTRATE THIS WARMEST SURGE OF STORMWATER. BASED ON ROUTING CALCULATIONS, STORMWATER IS NOT DISCHARGED FROM THE BMPS FOR THE FIRST 12 HOURS DURING A 100-YEAR/24-HOUR STORM EVENT. THE RETENTION PERIOD IS LONGER FOR LESS INTENSE STORMS. THEREFORE, THROUGH THESE MEASURES, THERE IS NO SIGNIFICANT THERMAL IMPACT TO THE RECEIVING WATERS ANTICIPATED.

NON-STRUCTURAL AND STRUCTURAL WATER QUALITY BMP DESCRIPTION

1. LIMIT OF DISTURBANCE WILL BE MINIMIZED TO THE MAXIMUM EXTENT POSSIBLE BY DISTURBING ONLY THOSE AREAS NECESSARY TO COMPLETE THE PROPOSED EARTHWORK AND BMP INSTALLATIONS.
2. SENSITIVE FEATURES SUCH AS WETLANDS WILL BE PROTECTED TO THE MAXIMUM EXTENT POSSIBLE. THESE AREAS WILL BE CLEARLY DELINEATED IN THE FIELD AND PROTECTED PRIOR TO ANY CONSTRUCTION ACTIVITIES TAKING PLACE. EXISTING VEGETATION IS NOT TO BE REMOVED FROM THE PROTECTED AREA AND THE AREAS SHALL NOT BE SUBJECT TO GRADING OR MOVEMENT OF EXISTING SOILS. ANY PROTECTED AREAS THAT HAVE BEEN DISTURBED/COMPACTED DURING CONSTRUCTION WILL BE RESTORED USING SOIL AMENDMENT AND RESTORATION.
3. DISTURBED AREAS THAT ARE NOT PROPOSED TO BE IMPERVIOUS WILL BE REVEGETATED AS PER THE SEEDING AND MULCHING NOTES PROVIDED IN PCSM PLAN NOTES.
4. AT THE EASTERN TERMINUS VALVE YARD SITE, VEGETATED SWALE AND SOIL AMEDNMENT AREA WILL ACT AS WATER QUALITY BMPS. WHEREVER POSSIBLE, EXISTING NATURAL DRAINAGE PATTERNS WILL BE UTILIZED TO DIVERT FLOW TO THE PROPOSED VEGETATED SWALE AND INFILTRATION BERM.
5. AT THE WESTERN TERMINUS VALVE YARD SITE, SOIL AMENDMENT AREA WILL ACT AS A WATER QUALITY BMP. WHEREVER POSSIBLE, EXISTING NATURAL DRAINAGE PATTERNS WILL BE UTILIZED TO DIVERT FLOW TO THE PROPOSED INFILTRATION BERM.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

NOTES

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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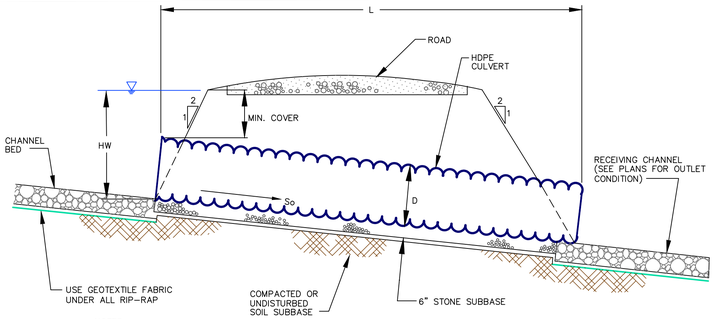
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 6
WO: 1211227	RID:		OF 8



NOTES:

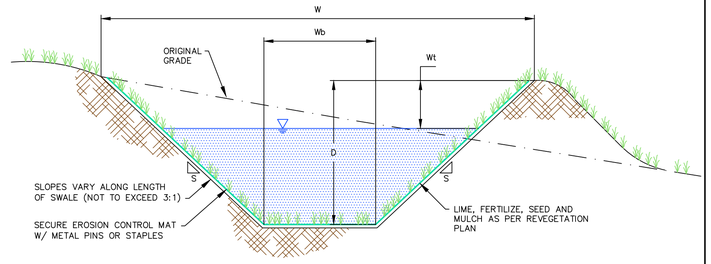
1. BARRELS SHALL BE PLACED AT THE MINIMUM SLOPE INDICATED FOR THE CHANNEL.
2. AN ADDITIONAL 0.5 OF FREEBOARD SHALL BE PROVIDED IN THE CHANNEL ON THE INVERT SIDE OF THE CULVERT.
3. IF MULTIPLE BARRELS ARE USED, THEY SHALL BE PLACED SUCH THAT THERE IS A MINIMUM OF 1 BARREL WIDTH BETWEEN.
4. CORRUGATED METAL OR HDPE MAY BE USED UPON EVALUATION BY AN ENGINEER.

ID	DRAINAGE AREA (AC)	REQ'D FLOW (CFS)	LENGTH (FT)	INLET INVERT (FT)	OUTLET INVERT (FT)	SLOPE (FT/FT)	NO. OF PIPES	PIPE DIAMETER (IN)
CULVERT #1	0.14	0.67	37.00	1686.2	1686.0	0.005	1	12

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
RC TYPICAL ACCESS ROAD CULVERT



Swale ID	Side Slope, S	Total Depth (ft) D	Freeboard WT (ft)	Bottom Width WB (ft)	Top Width W (ft)	Bottom Elevation	SHWT (inches below ground)	Bed Rock (inches below ground)
Swale #1	5/1	4	0.5	8	32	1662.0	Not Encountered	33"

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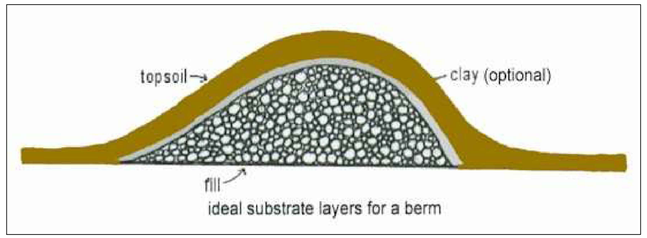
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
VEGETATED SWALE



NOTES:

AN INFILTRATION BERM IS A MOUND OF COMPACTED EARTH WITH SLOPING SIDES THAT IS USUALLY LOCATED ALONG A CONTOUR ON RELATIVELY GENTLY SLOPING SITES.

MAINTAIN A MINIMUM 2-FOOT SEPARATION TO BEDROCK AND SEASONALLY HIGH WATER TABLE, PROVIDE DISTRIBUTED INFILTRATION AREA (5:1 IMPERVIOUS AREA TO INFILTRATION AREA – MAXIMUM), SITE ON NATURAL, UNCOMPACTED SOILS WITH ACCEPTABLE INFILTRATION CAPACITY.

BERMS SHOULD BE RELATIVELY LOW, PREFERABLY NO MORE THAN 24 INCHES IN HEIGHT.

BERMS SHALL HAVE SIDE SLOPES OF 2:1 AND ARE NOT TO BE MOWED.

THE CREST OF THE BERM SHOULD BE LOCATED NEAR ON EDGE OF THE BERM, RATHER THAN IN THE MIDDLE, TO ALLOW FOR A MORE NATURAL, ASYMMETRICAL SHAPE.

BERMS SHOULD BE VEGETATED USING SEED MIXTURE 1 PLUS 3 FROM TABLE 11.5.

Infiltration Berm No.	Bottom Elev. (ft)	Top Elev. (ft)	H (ft)	Overal Length (ft)	SHWT (inches below ground)	Bed Rock (inches below ground)
#1	1683	1685	2	185	18"	27"
#2	1688	1690	2	320	26"	Not Encountered

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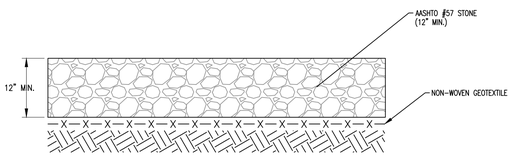
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
INFILTRATION BERM



NOTES:

1. CROSS SECTION TO BE APPLIED TO DRY AREAS WITHOUT DRAINAGE CONCERNS.
2. EXISTING MATERIAL TO BE REMOVED AND STOCKPILED IN AN APPROVED LOCATION ONLY.
3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

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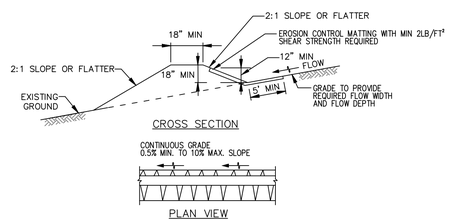
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
AR PERMANENT/TEMPORARY STONE ACCESS ROAD

TYPICAL MOUNTABLE EARTHEN BERM
NO SCALE



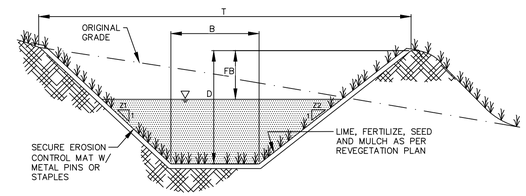
CONSTRUCTION SPECIFICATIONS

1. REMOVE AND DISPOSE OF ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SO AS NOT TO INTERFERE WITH PROPER FUNCTION OF EARTHDIKE.
2. EXCAVATE OR SHAPE EARTH DIKE TO LINE, GRADE, AND CROSS SECTION AS SPECIFIED. BANK PROJECTIONS OR OTHER IRREGULARITIES ARE NOT ALLOWED.
3. COMPACT FILL.
4. CONSTRUCT FLOW CHANNEL ON AN UNINTERRUPTED, CONTINUOUS GRADE, ADJUSTING THE LOCATION DUE TO FIELD CONDITIONS AS NECESSARY TO MAINTAIN POSITIVE DRAINAGE.
5. PROVIDE OUTLET PROTECTION AS REQUIRED ON APPROVED PLAN.
6. STABILIZE EARTH DIKE WITHIN THREE DAYS OF INSTALLATION. STABILIZE FLOW CHANNEL FOR CLEAR WATER DIVERSION WITHIN 24 HOURS OF INSTALLATION.
7. MAINTAIN LINE, GRADE, AND CROSS SECTION. REMOVE ACCUMULATED SEDIMENT AND DEBRIS, AND MAINTAIN POSITIVE DRAINAGE. KEEP EARTH DIKE AND POINT OF DISCHARGE FREE OF EROSION, AND CONTINUOUSLY MEET REQUIREMENTS FOR ADEQUATE VEGETATIVE ESTABLISHMENT IN ACCORDANCE WITH SECTION B-4 VEGETATIVE STABILIZATION.
8. UPON REMOVAL OF EARTH DIKE, GRADE AREA FLUSH WITH EXISTING GROUND. WITHIN 24 HOURS OF REMOVAL STABILIZE DISTURBED AREA WITH TOPSOIL, SEED, AND MULCH, OR AS SPECIFIED ON APPROVED PLAN.

ID	LENGTH (FT)	TOP WIDTH (FT)	BOTTOM WIDTH (FT)	DEPTH	SIDE SLOPE	OUTLET
1	211	2	10	2	2/1	INFILTRATION BERM/AMENDED SOIL

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

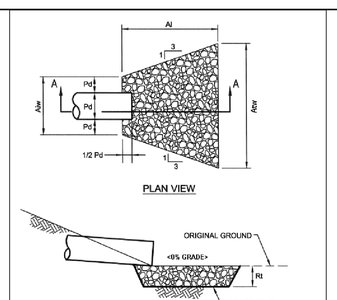
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
MEB MOUNTABLE EARTHEN BERM



CHANNEL ID	LENGTH (FT)	SLOPE (%)	BASE WIDTH (FT)	DEPTH (FT)	SIDE SLOPES (Z1/Z2)	TOP WIDTH (FT)	LINING	OUTLET
HR28	400	4.0	2	1.0	2/1	6	ECM (SC250)	VEGETATED SWALE
HR29	396	3.0	2	1.0	2/1	6	ECM (SC250)	INFILTRATION BERM/AMENDED SOIL
HR30	192	4.0	2	1.0	2/1	6	ECM (SC250)	CULVERT #1

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
DC TYPICAL DIVERSION CHANNEL (GRASS-LINED)



RIPRAP APRON OUTLET SCHEDULE

NO.	PIPE DIA. Do (IN)	MAN "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Alw (ft)	Atw (ft)
Culvert #1	12	0.012	0.048	0.67	0.85	R-3	9	6	3	9

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
OP RIPRAP APRON OUTLET PROTECTION

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

DETAILS SHEET 1

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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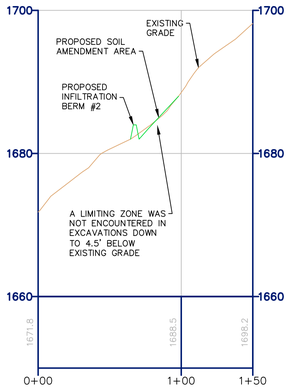
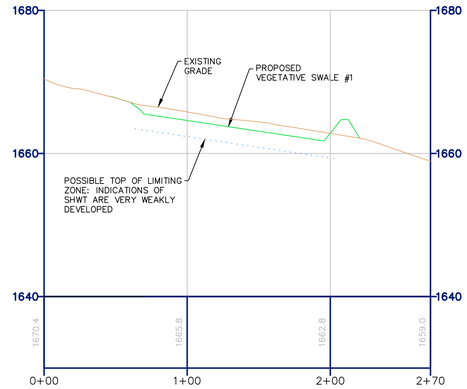
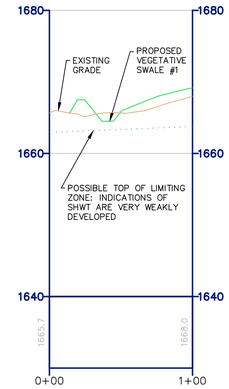
APPROVED BY: KCC	DATE: 9/20/19		SHEET 7
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 8



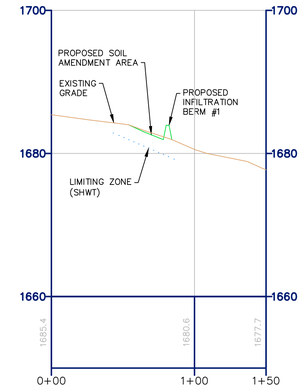
SECTION A–A' INFILTRATION BERM #2 WEST
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'



SECTION A–A' VEGETATIVE SWALE #1 EAST
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'



SECTION B–B' VEGETATIVE SWALE #1 EAST
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'



SECTION C–C' INFILTRATION BERM #1 EAST
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'

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REGISTERED PROFESSIONAL
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PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

PROFILES

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 8 OF 8
WO: 1211227	RID:		

Transcontinental Gas Pipe Line Company, LLC

Section 3-1 PCSM Plan for Hensel Replacement

Leidy South Project – Hensel Replacement

Eastern Terminus Main Line Valve and Access Road
&
Western Terminus Main Line Valve

September 2019
(Revised May 2020)

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- 7.1 Eastern Terminus Main Line Valve and Access Road
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- 8.1 Permanent Stabilization
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14.0 Non-Structural and Structural Water Quality BMP Description *(Added May 2020)*

15.0 The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques

Attachments

1 Project Location Maps

2 Soils Map and Report

3 Site Evaluation and Soil Infiltration Test Reports *(Revised May 2020)*

4 PCSM Plan BMP Design Worksheets and Calculations *(Revised May 2020)*

5 Non-Structural and Structural Water Quality BMPs Map *(Added May 2020)*

Drawings (NOI Checklist Item 7.i) *(Revised May 2020)*

1 of 8 Post Construction Stormwater Management Plan Cover

2 of 8 Post Construction Stormwater Management Plan
Western Terminus Main Line Valve - Existing Conditions

3 of 8 Post Construction Stormwater Management Plan
Western Terminus Main Line Valve – Proposed Conditions

4 of 8 Post Construction Stormwater Management Plan
Eastern Terminus Main Line Valve - Existing Conditions

5 of 8 Post Construction Stormwater Management Plan
Eastern Terminus Main Line Valve – Proposed Conditions

6 of 8 Post Construction Stormwater Management Plan Notes

7-8 of 8 Post Construction Stormwater Management Plan Details

1.0 Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Leidy South Project – Hensel Replacement. The Hensel Replacement consists of installing approximately 6.3 miles of 36-inch pipeline loop along Transco's Leidy Line in Leidy and Chapman Townships, Clinton County. This pipeline will replace the capacity of a segment of Transco's existing 23.375-inch Leidy Line A pipeline, and this segment of the Leidy Line A pipeline totaling 5.8 miles will be abandoned and removed with the exception of 0.8 mile under the Tamarack Swamp Natural Area, which is proposed to be grouted in-place. Once placed into operation, Transco will refer to the Hensel Replacement as the Leidy Line D. Transco will be relocating and installing a Mainline Valve (MLV) near the eastern terminus of the Hensel Replacement as a means to isolate gas flows along sections of a pipeline. At the western terminus of the Hensel Replacement at an existing MLV, pig traps and block valves will be added. Cathodic protection cable will be installed from proposed MLV near the eastern terminus to MP 190.5, and from the western terminus of Hensel Replacement to the Tamarack Swamp Natural Area and associated wetlands on the Leidy Line "A" and "B" existing right-of-way. The cathodic protection cable will be installed in the same trench as the pipeline within wetland, stream and floodway crossings. The Hensel Replacement will include the construction of one temporary offline contractor yard and five temporary contractor staging areas.

The Hensel Replacement is proposed as part of the overall Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

This PCSM Plan has been developed for the: (1) Eastern Terminus MLV and Access Road and (2) Modifications to the Western Terminus MLV site. The PCSM Plan shall be designed and implemented to be consistent with the Post Construction Stormwater Management (PCSM) Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). All work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the eastern terminus MLV site will be approximately 5.4 acres and the LOD

for the western terminus MLV site will be approximately 8.2 acres. Subject to receipt of permits and authorizations, Transco anticipates construction of the Project would commence in January 2021 to meet a target in-service date of December 1, 2021.

2.0 Topographic Features of the Area (NOI Checklist Item 7.a)

Project Location Maps for the eastern and western terminus MLV sites are included in Attachment 1. The maps show the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Tamarack and Renovo East, Pennsylvania quadrangles.

3.0 Receiving Surface Waters (NOI Checklist Item 7.e)

The following table (Table 1) lists each watershed located in eastern terminus and western terminus MLV Project Areas, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCGP-3 permit application.

Table 1 Receiving Waters

Watershed Name	Designated Use	Existing Use	PFBC Classification
Eastern Terminus Main Line Valve and Access Road			
Mudlick Run	EV, MF	-	Class A Wild Trout
Western Terminus Main Line Valve			
Turtle Point Hollow	EV, MF	-	Naturally Reproducing Trout
EV: Exceptional Value, MF: Migratory Fishes			

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 7.b, 7.l, 8.a, 8.e)

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 4 soil mapping units located within the LOD for eastern terminus MLV site and 1 soil mapping unit within the LOD for western terminus MLV site, see Table 2 below:

Table 2 – Soils mapping units within the LOD

Soil Mapping Unit	Soil Series
Eastern Terminus Main Line Valve and Access Road	
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony

HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony
Western Terminus Main Line Valve	
UpF	Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the eastern terminus and western terminus MLV sites and resolutions were identified in Section 4.1.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Clymer	CgB, HmD	X	C	X	X			X	X	X	X	X	X				X
Cookport	CgB, CpB	X	C/S	X	X		X	X	X	X	X	X	X				X
Hazleton	HmD	X	C	X	X			X	X	X	X	X	X				
Wharton	WeB	X	C/S		X		X	X	X	X	X	X	X	X			X
Ungers	UpF	X	C		X				X	X			X				

4.1 Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.

3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with all local, state, and federal regulations.
4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.
5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.
6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.
7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.
8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc. to minimize soil erosion.

4.2 Geologic Formations

Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis completed for the Project revealed that the Hensel Replacement does not cross any known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Hensel Replacement lies within a zone of moderate to high landslide incidence and susceptibility.

Due to the moderate to high landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed and is submitted with this application (Attachment B). This report provides information about any potential geological hazards occurring in the

vicinity of the Hensel Replacement Project area. The Geological Hazard Assessment and Mitigation Plan also identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 7.c)

Transco will be relocating and installing a Mainline Valve (MLV) near the eastern terminus as a means to isolate gas flows. Pig launchers/receivers, valves and other ancillary facilities will be located at this MLV facility. At the western terminus, at an existing MLV, pig traps and block valves will be added. All work and disturbed areas are located within Transco property, existing easements, or legally obtained workspace where the past, present, and proposed land use is primarily an existing pipeline ROW. All disturbed areas within the temporary workspaces will be restored to the original contours. Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (https://www.mrlc.gov/viewer/), it appears that a major portion of the eastern and western terminus sites were existing and maintained gas pipeline right-of-way for the past 20 years and will continue to be an existing and maintained gas pipeline right-of-way once the Project is complete. Along the edges of the ROW land use is primarily forested. Based on the surrounding land characteristics, land use prior to ROW construction within the past 50 years would likely have been either forested land or meadow. The proposed construction at both sites will consist of gravel pads and an additional access road will be constructed at eastern terminus MLV site. The contractor will construct stormwater BMPs to mitigate the increase in volume and peak rates associated with construction. The proposed BMPs are designed to evaporate and infiltrate the net increase in volume between the pre- and post-development 2-year rain events. Refer to the Stormwater BMP Sizing Calculations in Attachment 4 for additional information.

6.0 Post Construction Stormwater Management Best Management Practices, Installation Sequence and PCSM Critical Stages (NOI Checklist Item 7.f, 7.g)

Increase in stormwater runoff during and after construction shall be controlled by sequencing the operations and using a selection of Best Management Practices (BMPs).

6.1 Eastern Terminus Main Line Valve and Access Road

A vegetated swale and an infiltration berm with soil amendment will be used to attenuate and infiltrate runoff from impervious areas, simultaneously allowing some pollutants to settle out in the process. Three vegetated diversion channels constructed along the edges of the access

road will divert runoff to the swale and infiltration berm areas. All BMP design calculations and drawings are provided in Attachment 4 and PCSM Plan set.

BMP Installation Sequence (NOI Checklist Item 7.g)

The PCSM BMPs should be installed in a manner designed to:

1. Protect BMP areas associated with infiltration from compaction prior to and during installation.
2. Maintain proper Erosion and Sediment Control Measures during construction.
3. As areas are completed, seed and mulch in accordance with the section below.
4. Do not remove Erosion and Sediment Control measures until site is fully stabilized.
5. Install BMPs as follows:

   Diversion Channels

   a. Construct diversion channels as shown in the plan.
   b. Stabilize the channels with specified channel linings.

   Vegetated Swale

   a. Construct and stabilize the swale early in the construction schedule, preferably before mass earthwork and paving increase the rate and volume of runoff.
   b. Rough grade the vegetated swale. Avoid excessive compaction and/or land disturbance.
   c. As needed, remove unsuitable soil (clayey, rocky, coarse sands, etc.) to support dense vegetation, replacing with approximately 12 inches of loamy or sandy soils. Alkaline soils are recommended to further reduce and retain metals.
   d. Install outlet control structure.
   e. Final grade the swale to ensure accuracy.
   f. Seed and stabilize as soon as possible.
      i. Select dense and diverse close-growing, water-resistant plants whose growing season corresponds to the wet season.
      ii. Vegetation should be selected at an early stage in the design process, with well-defined pollution control goals in mind.
      iii. Selected vegetation must be able to thrive at the specific site and the

use of native plant species is strongly advised, as is the avoidance of invasive plant species.

iv. Swale vegetation must also be salt tolerant, as the paved roadway will undergo winter road maintenance activities that will contribute to salt/chlorides.

v. The swale is particularly vulnerable to scour and erosion prior to the establishment of vegetation. Protect the seed bed with temporary erosion control, such as straw matting, compost blankets, or curled wood blankets.

Infiltration Berm & Soil Amendment

a. All construction should be completed and stabilized before beginning soil restoration.
b. Soil amendment should only be performed when the soil conditions are dry and should only use a solid shank ripper, not a disk or plow due to their ineffectiveness.
c. Till soil by digging, scraping, and mixing of soil to circulate air into the soil mantle in various layers. If compaction occurs down to 20 inches below grade, ripping of soil is likely needed.
d. If necessary, add compost or other suitable material to increase water holding and retention capacity at the ratio of 2:1 (soil:compost).
e. Soil amendment and restoration should not take place within the drip line of trees or tree line to avoid damaging root system and should not take place over utility installations within 30 inches of the surface.
f. Construct the infiltration berm as shown on the plan. Avoid excessive compaction and/or land disturbance. Seed and stabilize as soon as possible.

6. Any sediment that enters BMPs during construction is to be removed within 24 hours.
7. Seed and stabilize remaining topsoil as per Seeding and Mulching section below.
8. Follow long term operation and maintenance guidelines discussed below.

PCSM Critical Stages

Critical points requiring visits by the licensed professional or delegate are as follows:

1. For the final grading of the access road, ensuring it is constructed according to the plan

details for proper conveyance of runoff.

2. Following final grading and seeding of the diversion channels, vegetated swale and infiltration berm, in order to confirm they have been constructed according to the plan details for proper collection, infiltration, and conveyance of runoff. Periodic assessments will need to be made to ensure accumulated sediment have been cleaned out so the swale maintains the necessary design volumes.
3. For the inspection of amended soil to ensure sufficient infiltration occurs behind the berm
4. During the layout and excavation of the outlet pipe, the professional or delegate will ensure sizing, materials specifications, and construction procedures are followed to enable proper storage in the swale and discharge to the pond.
5. For final inspection of constructed swale and infiltration berm.
6. At the establishment of hard surface stabilization or 70% vegetation covers to allow removal of E&S controls.

6.2 Western Terminus Main Line Valve

An infiltration berm and soil amendment will be used to attenuate and infiltrate runoff from impervious areas, simultaneously allowing some pollutants to settle out in the process. The infiltration berm will be constructed along the existing contour. Soil amendment will be done behind the berm to provide sufficient infiltration. The storage associated with the berm and soil amendment together will treat all required runoff volume based on the pre- to post-construction stormwater volume change. All BMP design calculations and drawings are provided in Attachment 4 and PCSM Plan set.

<u>BMP Installation Sequence (NOI Checklist Item 7.g)</u>

The PCSM BMPs should be installed in a manner designed to:

1. Protect BMP areas associated with infiltration from compaction prior to and during installation.
2. Maintain proper Erosion and Sediment Control Measures during construction.
3. As areas are completed, seed and mulch in accordance with the section below.
4. Do not remove Erosion and Sediment Control measures until site is fully stabilized.
5. Install BMPS as follows:
    - Install mountable berms/diversion channels as shown on the plan.

- Construct the infiltration berm as shown on the plan. Avoid excessive compaction and/or land disturbance. Seed and stabilize as soon as possible.

Soil Amendment

a. All construction should be completed and stabilized before beginning soil restoration.
b. Soil amendment should only be performed when the soil conditions are dry and should only use a solid shank ripper, not a disk or plow due to their ineffectiveness.
c. Till soil by digging, scraping, and mixing of soil to circulate air into the soil mantle in various layers. If compaction occurs down to 20 inches below grade, ripping of soil is likely needed.
d. If necessary, add compost or other suitable material to increase water holding and retention capacity at the ratio of 2:1 (soil:compost).
e. Soil amendment and restoration should not take place within the drip line of trees or tree line to avoid damaging root system and should not take place over utility installations within 30 inches of the surface.

6. Any sediment that enters BMPs during construction is to be removed within 24 hours.
7. Seed and stabilize remaining topsoil as per the specifications provided in the section below.
8. Follow long term operation and maintenance guidelines discussed below.

PCSM Critical Stages

Critical points requiring visits by the licensed professional or delegate are as follows:

1. Following final grading and seeding of the infiltration berm and installation of mountable berms/diversions in order to confirm they have been constructed according to the plan details for proper collection, infiltration, and conveyance of runoff. Periodic assessment will need to be made to ensure that accumulated sediment have been cleaned out so the area behind the berm maintains the necessary design volume.
2. For the inspection of amended soil to ensure sufficient infiltration occurs behind the berm
3. For final inspection of constructed infiltration berm.
4. At the establishment of hard surface stabilization or 70% vegetation covers to allow removal of E&S controls.

7.0 Net Change in Volume and Rate of Runoff (NOI Checklist Item 7.d, 8.b, 8.c, 8.d)

An analysis of pre- and post-development stormwater runoff was performed for the two proposed MLV sites associated with the Hensel Replacement. The installation of valve and associated access road will increase the volume of stormwater runoff between the pre and post development 2 year rain event due to the increase in the type and size of the impervious area. The increase in impervious area will increase the pre to post development peak runoff for the 1, 2, 10, 25, 50, and 100 year storm events. Design calculations using HydroCAD software are included in Attachment 4. Refer to the Post-Construction Stormwater Management (PCSM) Plan drawings for additional information.

7.1 Eastern Terminus Main Line Valve and Access Road

Pre- and Post-Construction Stormwater Volume for 2-yr Rainfall event

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction after BMPs (cf)	Net (cf)
1,761	4,118	0	-1,761

Pre-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.03	0.16	1.20	2.30	3.41	4.75

Post-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.36	0.98	3.33	5.23	7.05	9.12

Post-Construction w/ BMPs Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0	0	0	0.16	0.46	1.75

Difference between Pre-Construction and Post-Construction w/ BMPs

	1-year	2-year	10-year	25-year	50-year	100-year
NET Difference	-0.03	-0.16	-1.2	-2.14	-2.95	-3.00

7.2 Western Terminus Main Line Valve

Pre- and Post-Construction Stormwater Volume for 2-yr Rainfall event

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction after BMPs (cf)	Net (cf)
5,532	6,229	1,525	-4,007

Pre-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.17	1.09	5.67	9.63	13.34	17.88

Post-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.42	1.77	7.36	11.97	16.35	21.44

Post-Construction w/ BMPs Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.04	0.43	2.28	3.85	6.94	17.68

Difference between Pre-Construction and Post-Construction w/ BMPs

	1-year	2-year	10-year	25-year	50-year	100-year
NET Difference	-0.13	-0.66	-3.39	-5.78	-6.40	-0.20

8.0 Temporary and Permanent Stabilization

Appropriate seed mixtures for temporary and permanent stabilization are outlined on the notes sheet of the plan drawings.

8.1 Permanent Stabilization

Upon final completion of an earth disturbance activity or any stage or phase of an activity, the site shall immediately have topsoil restored, replaced, or amended, seeded, mulched or otherwise permanently stabilized and protected from accelerated erosion and sedimentation. E&S BMPs shall be implemented and maintained until the permanent stabilization is completed. Once permanent stabilization has been established, the temporary E&S BMPs shall be removed. Any areas disturbed in the act of removing temporary E&S BMPs shall be permanently stabilized upon completion of the temporary E&S BMP removal activity. For an earth disturbance activity or any stage or phase of an activity to be considered permanently stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which permanently minimizes accelerated erosion and sedimentation.

- When erosion and sedimentation controls are to be removed in agricultural non-sensitive areas (streams/wetlands), agricultural landowners shall maintain agricultural BMPs per PaDEP regulations.

8.2 Temporary Stabilization

Upon temporary cessation of an earth disturbance activity or any stage or phase of an activity where a cessation of earth disturbance activities will exceed 4 days (including agricultural areas), the site shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage or phase of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which temporarily minimizes accelerated erosion and sedimentation.

8.3 Stabilization During Non-Growing Season

When utility construction must be done and is completed during a non-growing season, interim stabilization BMPs must be implemented and adequately maintained. The application of straw mulch at the rate of 3.0 tons per acre is required. The BMPs should be inspected weekly (unless snow covered) and after each runoff event to identify areas that become bare. All temporary erosion and sediment pollution controls must be maintained.

9.0 Long Term Operation and Maintenance Schedule (NOI Checklist Item 7.j)

All BMPs should be properly maintained to ensure their effectiveness. Sheet flow conditions and infiltration must be sustained throughout the life of the BMP. BMPs should be inspected for clogging from sediment of debris, damage by foot or vehicular traffic, and flow channelization. Inspections should be made on a quarterly basis for the first two years following installation, and then twice per year thereafter. Inspections should also be made after every storm event greater than 1 inch during the establishment period.

Channel linings should be inspected for signs of erosion or dislodging, as applicable. Channels should be inspected for debris, overgrown vegetation, and other blockages. Vegetated areas will be inspected weekly and after runoff events until permanent vegetation is achieved.

Once the vegetation is established, inspections of health, diversity, and density should be performed at least twice per year, during both the growing and non-growing season. Vegetative cover should be sustained at 85% and reestablished if damage greater than 50% is observed. Damaged BMPs will be repaired as soon as possible upon discovery. Repairs will be made to restore to BMPs to the original design condition.

Operation and maintenance guidelines should be provided to all facility owners and tenants. Sediment and debris should be routinely removed upon observation. If erosion is observed, measures should be taken to improve the dispersion method to address the source of erosion. Sediment should be removed when the BMP is thoroughly dry. Trash and debris removed from the site should be deposited only at suitable disposal/recycling sites and must comply with applicable local, state, and federal waste regulations. Grass cover should be mowed with low ground pressure equipment as needed to control noxious weeds. Mowing should be done only when the soil is dry in order to prevent tracking damage to vegetation, soil compaction, and flow concentrations. If vegetative cover is not fully established within the designated time, it should be replaced with an alternative species. Unwanted or invasive growth should be removed on an annual basis.

Vegetated areas will be inspected weekly and after runoff events until permanent vegetation is achieved. Once the vegetation is established, inspections of health, diversity, and density should be performed at least twice per year, during both the growing and non-growing season. Vegetative cover should be sustained at 85% and reestablished if damage greater than 50% is observed. Damaged BMPs will be repaired as soon as possible upon discovery. Repairs will be made to restore damaged BMPs to the original design condition.

Maintenance activities on the vegetated swale should be done annually and within 48 hours after every major storm event (> 1-inch rainfall depth). Erosion problems, damage to vegetation, sediment and debris accumulation, uniformity of in cross-section and pools of standing water should be inspected.

10.0 Recycling and Disposal of Materials (NOI Checklist Item 7.k)

The restoration of the pipeline right-of-way will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here):

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Material Safety Data Sheets (MSDSs).

11.0 Thermal Impacts (NOI Checklist Item 7.m)

Due to the overall nature of the Project, thermal impacts to surface waters are not anticipated. The pipeline installation activities will primarily take place within an existing cleared and maintained pipeline right-of-way. There will be no increase in stormwater discharge. The primary means to address thermal impacts on this Project is to limit the size and duration of exposed earth. Revegetation procedures and the Sequence of Construction outline disturbed areas being immediately revegetated.

Stormwater runoff associated with the installation of the MLV's will be routed through the stormwater BMP's designed to retain and infiltrate the first surge of water from the site. The first surge of water will be the warmest water for the duration of the storm event and will quickly cool

as the storm event progresses. The BMPs are designed to capture and infiltrate this warmest surge of stormwater. Based on routing calculations, stormwater is not discharged from the BMPs for the first 12 hours during a 100-year/24-hour storm event. The retention period is longer for less intense storms. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

12.0 Antidegradation Requirements (NOI Checklist Item 7.o, 8.f)

Transco evaluated the feasibility of non-discharge alternatives that would be located outside of exceptional value (EV) or high-quality (HQ) watersheds. Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. The hydraulic model determined the eastern and western terminus of the Hensel Replacement. In order for the Project to meet the required purpose and need, siting the Hensel Replacement outside of EV and HQ watersheds, is not feasible.

Therefore, Transco determined that there are no cost-effective and environmental sound viable non-discharge alternatives for the project. Transco has minimized project impacts to EV and HQ watersheds through the use of co-location with existing pipelines and protecting riparian buffers within the project workspace. Earth disturbance will be minimized to the extent practical and will be phased or sequenced to only disturbed portions that are necessary for the specific scope of work. Wherever possible, the LOD was decreased to avoid disturbing additional ground and will be kept to the minimum width and depth necessary to safely complete construction activities

Anti-Degradation Best Available Combination of Technologies (ABACT) standards have been proposed for the eastern and western terminus MLV sites because there are no viable non-discharge alternatives. The Erosion and Sediment Control Plan prepared for the Project outlines a more stringent design and E&S BMPs that meet ABACT standards.

The eastern and western terminus MLV sites will result in increased discharge of stormwater to surface waters which will be mitigated by the implementation of post-construction stormwater management (PCSM) BMP's. Proposed PCSM BMPs are designed with stormwater volume reduction and water quality treatment maximized to the extent practicable within the site constraints to maintain and protect existing water quality and existing and designated uses.

13.0 Riparian Buffers (NOI Checklist Item 7.n)

No existing riparian buffers have been identified within or near the eastern and western terminus MLV site locations.

14.0 Non-Structural and Structural Water Quality BMP Description

Limit of disturbance will be minimized to the maximum extent possible by disturbing only those areas necessary to complete the proposed earthwork and BMP installations.

Sensitive features such as wetlands will be protected to the maximum extent possible. These areas will be clearly delineated in the field and protected prior to any construction activities taking place. Existing vegetation is not to be removed from the protected area and the areas shall not be subject to grading or movement of existing soils. Any protected areas that have been disturbed/compacted during construction will be restored using soil amendment and restoration.

Disturbed areas that are not proposed to be impervious will be revegetated as per the seeding and mulching notes provided in PCSM plan notes.

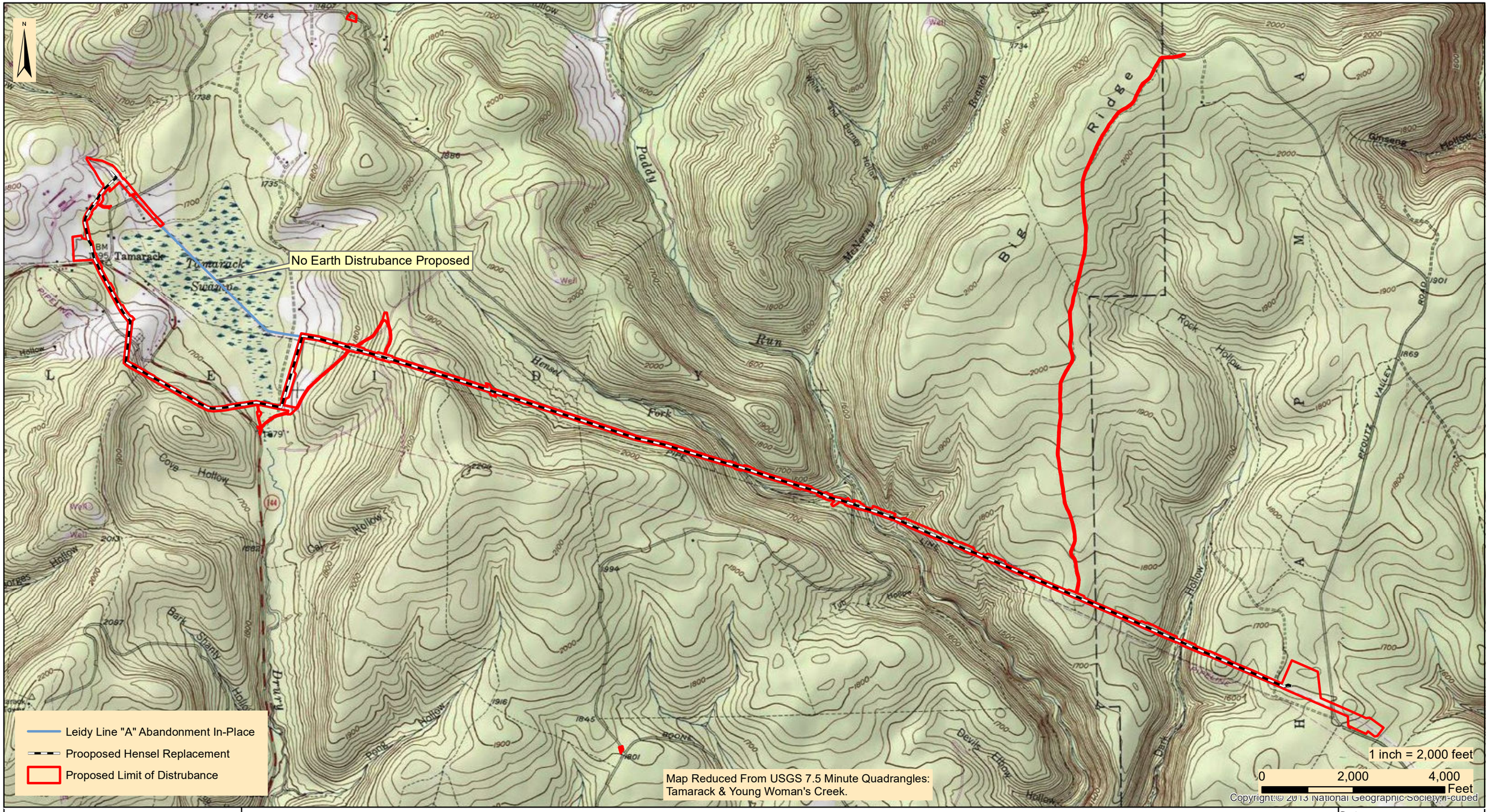
At the Eastern Terminus Valve Yard site, vegetated swale and soil amendment area will act as water quality BMPs. Wherever possible, existing natural drainage patterns will be utilized to divert flow to the proposed vegetated swale and infiltration berm.

At the Western Terminus Valve Yard site, soil amendment area will act as a water quality BMP. Wherever possible, existing natural drainage patterns will be utilized to divert flow to the proposed infiltration berm.

15.0 The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques

These plans and narrative were prepared by Kevin Clark, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Stormwater BMP Manual, December 2006. Plan preparer's resume is provided in Attachment C of the ESCGP-3 permit package).

ATTACHMENT 1
PROJECT LOCATION MAP



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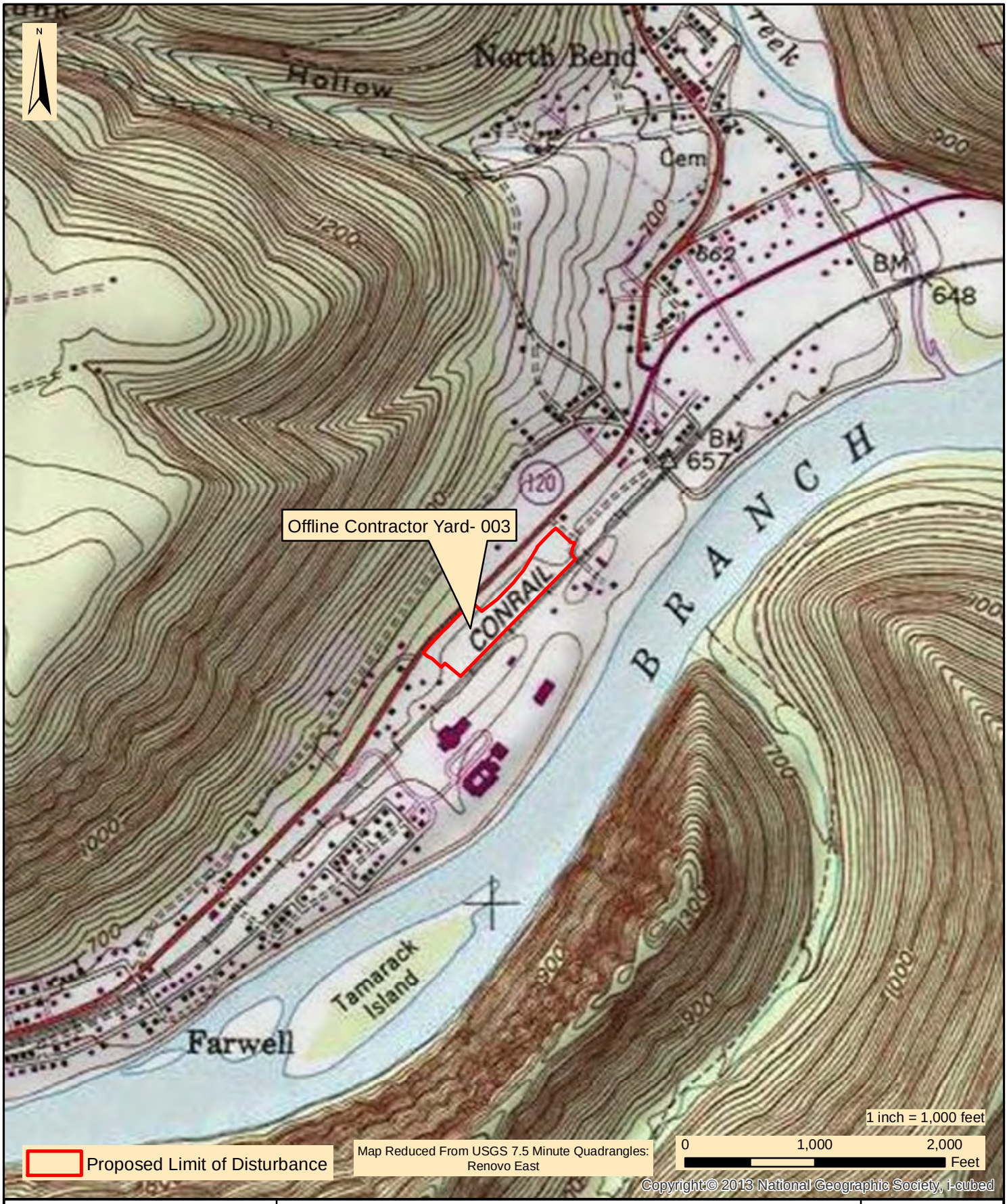
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 36" HENSEL REPLACEMENT PROJECT LOCATION MAP

LEIDY & CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	4/28/2020
WHM DRAWING NUMBER:	WILLIAMS202B001
Drawn By:	FTN
Figure Number:	1-1



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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 36" HENSEL REPLACEMENT
PROJECT LOCATION MAP

CHAPMAN TOWNSHIP CLINTON COUNTY PENNSYLVANIA

Date:	8/21/2019
WHM Drawing Number:	WILLIAMS200A001-1
Drawn By:	FTN
Figure Number:	1-2

ATTACHMENT 2
SOILS MAP AND REPORT

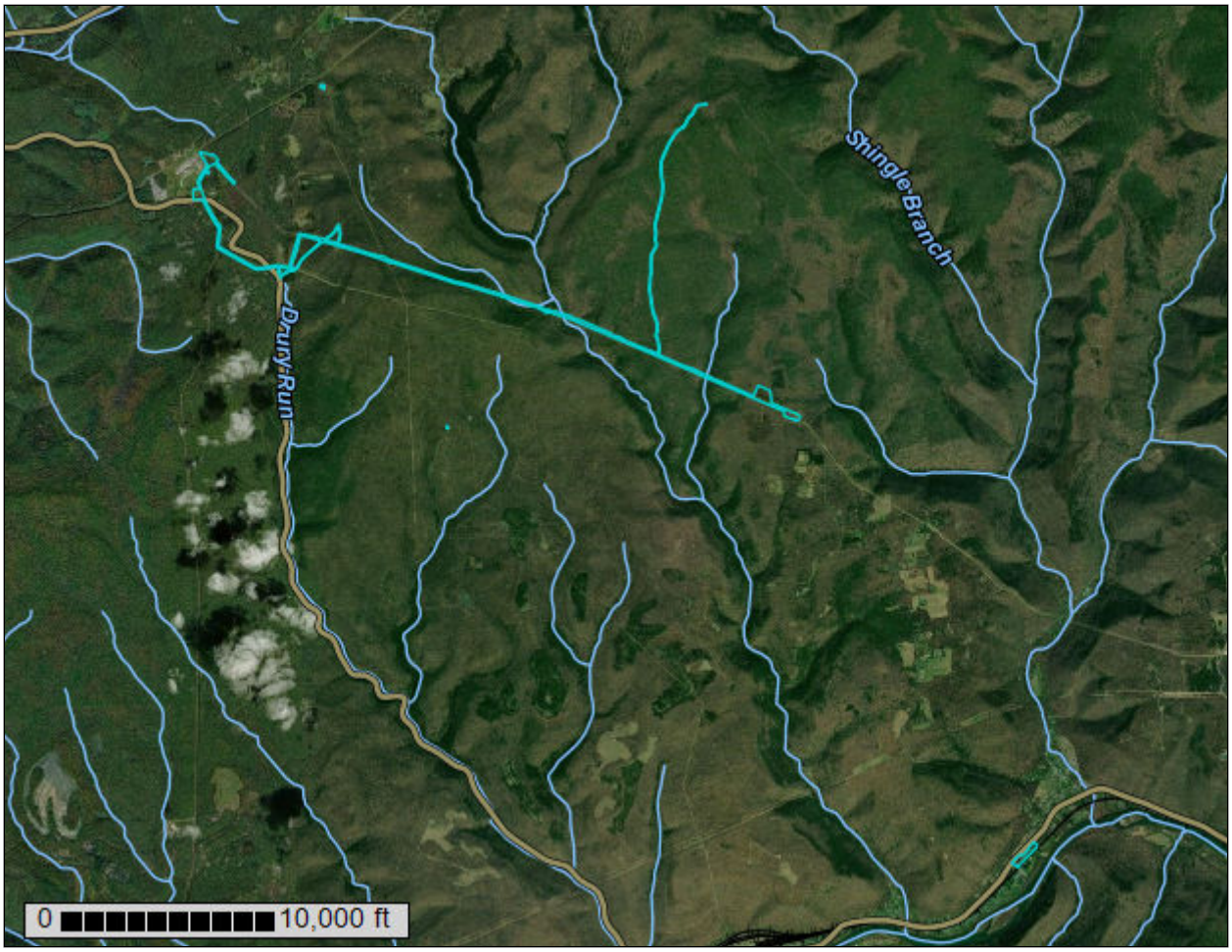
United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Clinton County, Pennsylvania

Hensel Replacement



July 2, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

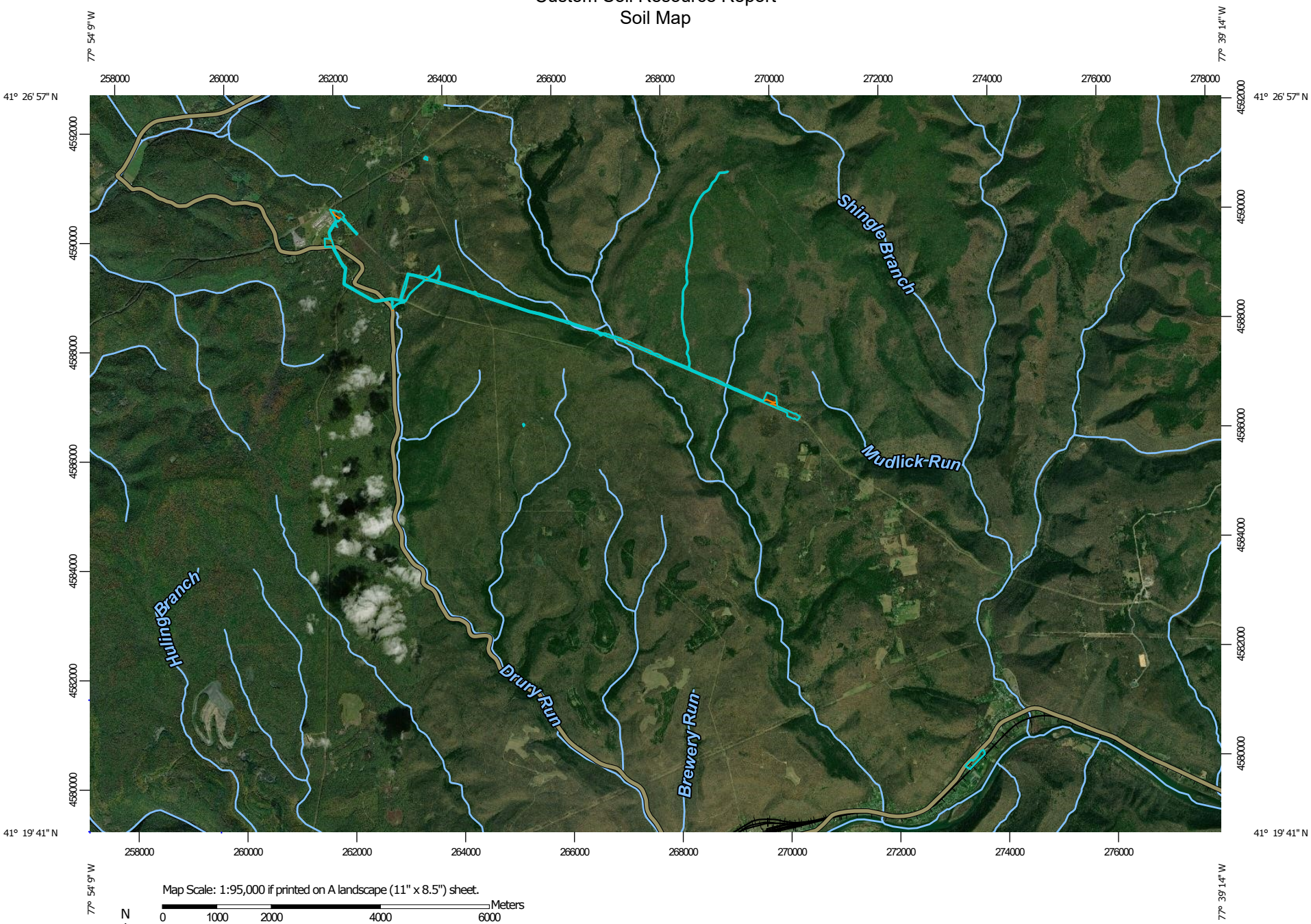
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:95,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 1000 2000 4000 6000

Feet: 0 4500 9000 18000 27000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clinton County, Pennsylvania
Survey Area Data: Version 14, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 4, 2012—Sep 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
At	Atkins silt loam, 0 to 3 percent slopes, frequently flooded	2.4	1.7%
CaB	Calvin channery silt loam, 3 to 8 percent slopes	1.0	0.7%
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony	11.6	8.5%
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony	12.5	9.2%
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony	11.1	8.2%
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony	13.4	9.9%
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony	10.7	7.9%
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony	36.6	27.0%
HuB	Hustontown silt loam, 3 to 8 percent slopes	6.4	4.7%
LdC	Laidig gravelly loam, 8 to 25 percent slopes, extremely stony	0.3	0.2%
Lr	Linden silt loam, rarely flooded	8.6	6.3%
MhD	Meckesville channery loam, 8 to 25 percent slopes, very stony	2.5	1.8%
UnB	Ungers loam, 3 to 8 percent slopes	9.4	6.9%
UpF	Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony	5.0	3.7%
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony	4.1	3.0%
Totals for Area of Interest		**135.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps.

The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clinton County, Pennsylvania

At—Atkins silt loam, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2sfsp
Elevation: 550 to 2,790 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Atkins and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Atkins

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Acid fine-loamy alluvium derived from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 8 inches: silt loam
Bg - 8 to 26 inches: loam
BCg - 26 to 38 inches: silt loam
Cg - 38 to 80 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Philo

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Basher

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Linden

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

CaB—Calvin channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l801
Elevation: 300 to 2,800 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Calvin and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calvin

Setting

Landform: Ridges on valleys
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest

Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Acid reddish brown residuum weathered from shale and siltstone

Typical profile

A - 0 to 1 inches: channery silt loam
BE - 1 to 3 inches: very channery silt loam
Bw - 3 to 30 inches: very channery silt loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Klinesville

Percent of map unit: 10 percent
Landform: Ridges, valleys
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Meckesville

Percent of map unit: 5 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hustontown

Percent of map unit: 5 percent
Hydric soil rating: No

Leck kill

Percent of map unit: 5 percent
Hydric soil rating: No

CfB—Clymer channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80f
Elevation: 1,000 to 4,000 feet
Mean annual precipitation: 32 to 60 inches
Mean annual air temperature: 45 to 59 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Hartleton

Percent of map unit: 5 percent
Landform: — error in exists on —
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leetonia

Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

CgB—Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80g
Elevation: 1,000 to 2,500 feet
Mean annual precipitation: 35 to 60 inches

Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 101 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 40 percent
Cookport and similar soils: 35 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: channery loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Cookport

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from acid sandstone

Typical profile

A - 0 to 8 inches: channery loam

Bt - 8 to 22 inches: loam
Btx - 22 to 46 inches: loam
C - 46 to 54 inches: channery loam
R - 54 to 64 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Wharton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Dekalb

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Buchanan

Percent of map unit: 5 percent

Hydric soil rating: No

CpB—Cookport channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshh
Elevation: 910 to 2,620 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

CpD—Cookport channery loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshq
Elevation: 610 to 2,450 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 80 percent
Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: Yes

Hazleton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

HmD—Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l82t
Elevation: 800 to 4,000 feet
Mean annual precipitation: 32 to 55 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 50 percent
Clymer and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Laidig
Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Wharton
Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Unnamed
Percent of map unit: 5 percent
Hydric soil rating: No

Leetonia
Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

HoF—Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony

Map Unit Setting
National map unit symbol: l82w
Elevation: 800 to 2,900 feet
Mean annual precipitation: 34 to 60 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Hazleton and similar soils: 35 percent
Laidig and similar soils: 35 percent

Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Laidig

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Stony colluvium derived from sandstone and shale

Typical profile

A - 0 to 3 inches: extremely stony loam
Bt - 3 to 34 inches: gravelly silt loam
Btx - 34 to 65 inches: very channery silty clay loam

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 50 inches to fragipan; 61 to 120 inches to lithic bedrock

Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 27 to 47 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clymer
Percent of map unit: 10 percent
Hydric soil rating: No

Hapludults, nonstony
Percent of map unit: 10 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 10 percent
Hydric soil rating: No

HuB—Hustontown silt loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: l835
Elevation: 600 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Hustontown and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hustontown

Setting
Landform: Valley sides
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase

Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Red residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 7 inches: silt loam
Bt - 7 to 24 inches: silt loam
Bt - 24 to 30 inches: channery silt loam
Btx - 30 to 65 inches: channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 32 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 12 to 26 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ungers

Percent of map unit: 5 percent

Unnamed

Percent of map unit: 5 percent

Leck kill

Percent of map unit: 5 percent

LdC—Laidig gravelly loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l83s

Elevation: 900 to 1,400 feet
Mean annual precipitation: 34 to 55 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 110 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Laidig and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laidig

Setting

Landform: Mountain slopes, valley sides
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Stony colluvium derived from sedimentary rock

Typical profile

A - 0 to 3 inches: gravelly loam
Bt - 3 to 34 inches: gravelly silt loam
Btx - 34 to 65 inches: very channery silty clay loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 50 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 27 to 47 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Buchanan

Percent of map unit: 10 percent
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Clymer
Percent of map unit: 5 percent
Hydric soil rating: No

Murrill
Percent of map unit: 5 percent
Hydric soil rating: No

Lr—Linden silt loam, rarely flooded

Map Unit Setting
National map unit symbol: l84b
Elevation: 520 to 1,000 feet
Mean annual precipitation: 32 to 45 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 140 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Linden and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Linden

Setting
Landform: Flood plains on river valleys
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile
Ap - 0 to 12 inches: silt loam
B - 12 to 48 inches: gravelly silt loam
C - 48 to 70 inches: sandy loam

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 36 to 72 inches

Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Philo
Percent of map unit: 10 percent
Hydric soil rating: No

Barbour
Percent of map unit: 5 percent
Hydric soil rating: No

Basher
Percent of map unit: 5 percent
Hydric soil rating: No

MhD—Meckesville channery loam, 8 to 25 percent slopes, very stony

Map Unit Setting
National map unit symbol: l84q
Elevation: 700 to 1,100 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition
Meckesville and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Meckesville

Setting
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile
A - 0 to 4 inches: channery loam

Bt - 4 to 35 inches: channery silt loam
Btx - 35 to 66 inches: channery silt loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 3.0 percent
Depth to restrictive feature: 30 to 48 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 27 to 45 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Ungers

Percent of map unit: 10 percent
Hydric soil rating: No

Laidig

Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Albrights

Percent of map unit: 5 percent
Hydric soil rating: No

UnB—Ungers loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l863
Elevation: 900 to 2,200 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 110 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ungers and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ungers

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Ap - 0 to 9 inches: loam
Bt - 9 to 33 inches: channery clay loam
BC - 33 to 48 inches: very channery clay loam
R - 48 to 58 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Hydric soil rating: No

Leck kill

Percent of map unit: 5 percent
Hydric soil rating: No

Hustontown

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

UpF—Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l869
Elevation: 900 to 2,200 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Ungers and similar soils: 50 percent
Meckesville and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ungers

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and siltstone

Typical profile

A - 0 to 6 inches: very stony loam
Bt - 6 to 33 inches: very channery clay loam
BC - 33 to 48 inches: very channery clay loam
R - 48 to 58 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B

Hydric soil rating: No

Description of Meckesville

Setting

Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 35 inches: channery silt loam
Btx - 35 to 66 inches: channery silt loam

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 48 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 30 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Leck kill

Percent of map unit: 10 percent
Hydric soil rating: No

Albrights

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

WeB—Wharton silt loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: l86l
Elevation: 1,600 to 2,350 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Wharton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave, convex
Parent material: Stony interbedded residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 20 inches: silt loam
Bt - 20 to 45 inches: channery silt loam
BC - 45 to 65 inches: very channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 61 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 15 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Tilsit

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

References

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ATTACHMENT 3
SITE EVALUATION AND SOIL INFILTRATION TEST REPORT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC,
A SUBSIDIARY OF THE WILLIAMS COMPANIES, INC.
LUCKY LEAP (HENSEL) POTENTIAL INFILTRATION BASIN PROJECT

SITE EVALUATION AND SOIL INFILTRATION REPORT

1.0 Site Soils

Based upon mapping provided by the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS) Web Soil Survey[1], the project area is underlain by the following soil series: Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony (HmD).

Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony (HmD) soils consist of strongly sloping and moderately steep, well drained soils, found on mountain ridges. The parent material is stony residuum weathered from sandstone and shale. Bedrock is typically found between 40 to 68 inches. The available water capacity of this HmD soils is low. Permeability is Moderately rapid or rapid. Runoff is low to medium.

The soil infiltration testing described in this section focused on HmD soils. These soils are anticipated as being the primary soils in the area of the infiltration basin.

2.0 Field Investigation and Testing Methodology

BAI completed a total of three test pits and three double-ring infiltrometer tests; locations were selected to be representative of the main soil series in the area of the potential infiltration basin. Figure 1 presents field-located stations of test pits and corresponding double-ring infiltrometer tests.

Three soil test pits (TP-1, -2, and -3) were dug by hand on May 23, 2019 to depths of approximately 18 inches to evaluate infiltration rates within soils in the study area. Three double-ring infiltrometer (DRI) tests were conducted on May 23, 2019 within each of the test pits completed by BAI. The double-ring infiltration tests consisted of an 11-inch diameter outer ring (OR) and a 4-inch diameter inner ring (IR) set 4-5 inches deep into the bottom of each test pit (approximately 22 inches below grade) to determine infiltration rates of shallow soils at various locations across the site. DRI testing was initiated by completing a one-hour pre-soak, which involved adding six (6) inches of head to both the OR and IR. By noting the drop in head in each infiltrometer at 30 minute increments during the pre-soak, BAI determined that 30-minute testing intervals for TP-1 and TP-3, and 10-minute testing intervals for TP-2, would be used for DRI testing as per the Pennsylvania stormwater Best Management Practices Manual (Document ID 363-0300-002) Appendix C.

Following the pre-soak, test pits TP-1, TP-2, and TP-3 were refilled to a six (6) inch head level in both the IR and OR. Drop in head was measured from a fixed reference point in the IR every 10 minutes for TP-2, and 30 minutes TP-1 and TP-3. The IR and OR were refilled following each reading. Results for DRI tests are discussed in Section 3.0.

Three test pits, TP-4, TP-5 & TP-6, were completed in April 20, 2020 to characterize soils and identify limiting zones in Lucky Leap. Test pits were made using an excavator, digging to a depth of 54 inches. The locations of the 2020 test pits are seen in Figure 1 and results are discussed in Section 3.0.

[1] http://websoilsurvey.nrcs.usda.gov/app/

3.0 Findings and Conclusions

Based upon examination of each test pit, soils beneath the Site consist of very stony, very dark, greyish brown (10YR 3/2) channery, loam to a depth of at least 4.5 inches. This was located below a thin, approximately 1 to 1.5 inch layer of organic matter. From 4.5 to 9 inches a grayish brown (10YR 5/2) very channery, sandy loam was observed. The soil from 9 to 18 inches consisted of a reddish brown (5YR 4/4) channery sandy loam. Testing was completed within the same soil series at three locations spread out in the area of the potential BMP location.

For the limiting zone investigation, TP-4 had a limiting zone at the SHWT at 32 inches below grade surface (bgs). TP-6 a limiting zone at the SHWT at 18 inches bgs. TP 5 had a limiting zone at SHWT at 32 inches bgs. None of the test pits encountered bedrock nor water table.

The following tables summarize the DRI readings for each test pit and the limiting zones identified in each test pit.

		Infiltration Testing Results								
Hole	Reading Interval	Reading 1 (in.)	Reading 2 (in.)	Reading 3 (in.)	Reading 4 (in.)	Reading 5 (in.)	Reading 6 (in.)	Reading 7 (in.)	Reading 8 (in.)	Infiltration Rate (in./hr)
TP1	30 min	0.375	0.375	0.375	0.375					0.75
TP2	10 min	0.75	0.5	0.5	0.5	0.4375	0.4375	0.375	0.375	2.44
TP3	30 min	0.25	0.25	0.25	0.25					0.50

TP-1

The infiltration rate within TP-1 was 0.75 inches per hour (iph) based upon an average rate of drop of 0.375 inches over the four 30-minute infiltration readings.

TP-2

The infiltration rate within TP-2 was 2.44 inches per hour (iph) based upon an average rate of drop of 0.406 inches over the last four 10-minute infiltration readings.

TP-3

The infiltration rate within TP-3 was 0.50 inches per hour (iph) based upon an average rate of drop of 0.25 inches over the four 30-minute infiltration readings.

Limiting Zone Investigation Results					
Test Pit	Ground Surface Elevation (feet AMSL)	SHWT (in)	Bedrock (in)	Water Table (in)	Total Depth (in)
TP 4	1684	32	Not Encountered	Not Encountered	33
TP 5	1666	32	Not Encountered	Not Encountered	33
TP 6	1682	18	Not Encountered	Not Encountered	27

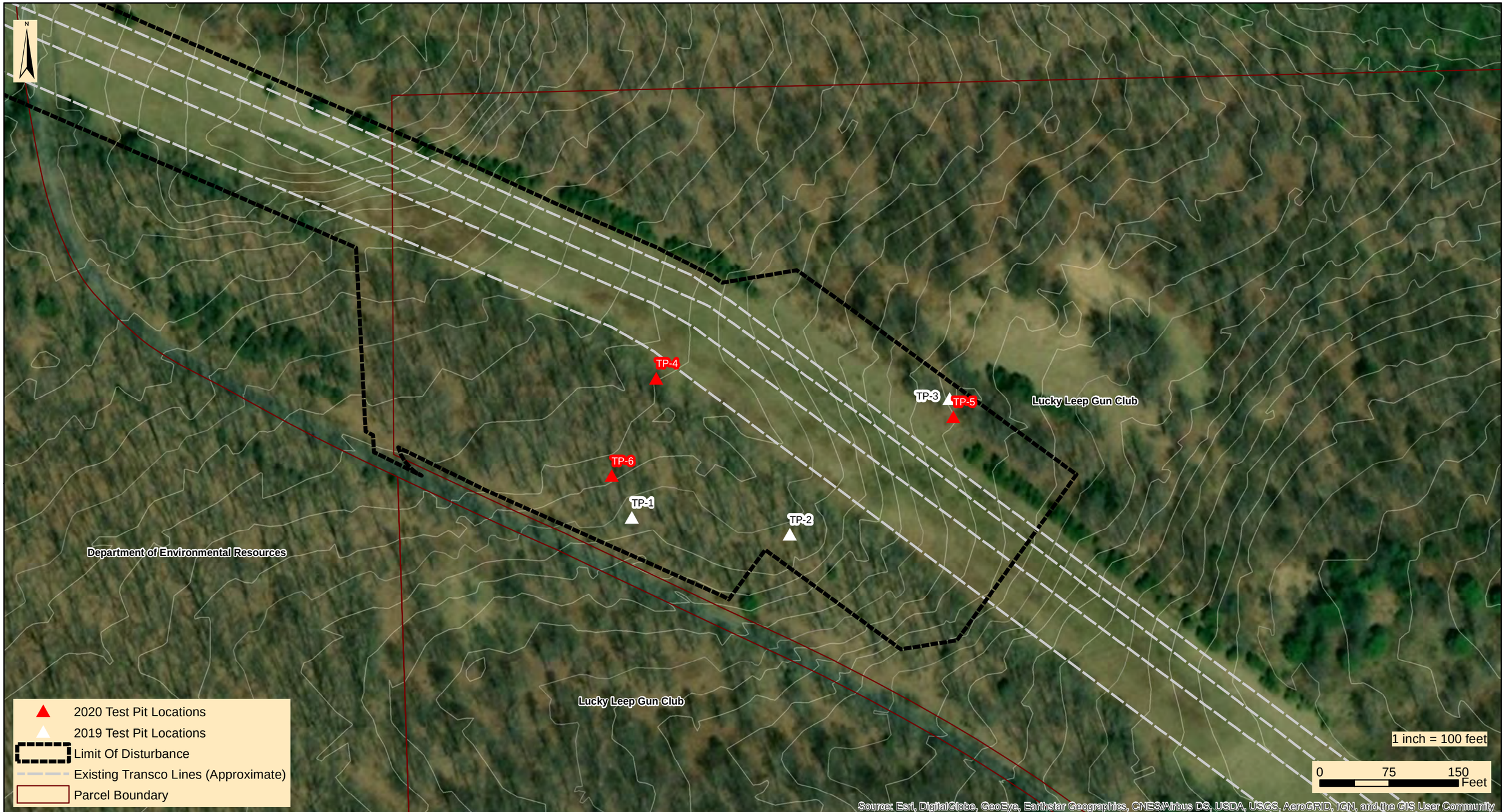
Average Site Infiltration Rate and Discussion

Based upon the results of double-ring infiltration testing completed by BAI, the overall average infiltration rate within the proposed infiltration basin area is 1.23 inches per hour. We feel this rate is representative of the infiltration rate for the HmD soils at depths up to 22 inches, within the proposed infiltration basin area.

References

Pennsylvania Department of Environmental Protection. "Pennsylvania Stormwater Best Management Practices Manual" Document No. 363-0300-02, December 2006.

"Web Soil Survey - Home." Web Soil Survey - Home. United States Department of Agriculture, 6 Dec. 2013. Web. 16 May 2019. <http://websoilsurvey.nrcs.usda.gov/app/>.



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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH - HENSEL REPLACEMENT

SOIL TEST PIT LOCATIONS (EASTERN TERMINUS)

CLINTON COUNTY

PENNSYLVANIA

Date:	05/21/20
WHM DRAWING NUMBER:	WILLIAMS200B001_IT
Drawn By:	BWH
Figure Number:	1

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC.
WESTERN TERMINUS POTENTIAL INFILTRATION BASIN PROJECT

SITE EVALUATION and SOIL INFILTRATION TEST REPORT

1.0 Site Soils

Based upon mapping provided by the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS) Web Soil Survey[1], the project area is underlain by the following soil series: Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony (UpF).

Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony (UpF) soils consist of strongly sloping and moderately steep, well drained soils, found on mountain slopes. The parent material is primarily stony residuum weathered from sandstone and siltstone. Bedrock is typically found at 40 to 60 inches depth, and, potentially, a fragipan can be found at a depth between 30-48 inches. The available water capacity of this UpF soils is low. Permeability is moderately slow to moderate. Runoff is high.

The soil infiltration testing described in this section focused on UpF soils. These soils are anticipated as being the primary soils in the area of the potential infiltration basin.

2.0 Field Investigation and Testing Methodology

BAI completed a total of three test pits and three double-ring infiltrometer tests; locations were selected to be representative of the main soil series in the area of the proposed infiltration basin. Figure 1 presents field-located stations of test pits and corresponding double-ring infiltrometer tests.

Three soil test pits (TP-1, -2, and -3) were dug by hang on May 24, 2019 to depths of approximately 24 inches to evaluate infiltration rates within soils in the study area. Three double-ring infiltrometer (DRI) tests were conducted on May 24, 2019 within each of the test pits completed by BAI. The double-ring infiltration tests consisted of an 11-inch diameter outer ring (OR) and a 4-inch diameter inner ring (IR) set 4-5 inches deep into the bottom of each test pit (approximately 28 inches below grade) to determine infiltration rates of shallow soils at various locations across the site. DRI testing was initiated by completing a one-hour pre-soak, which involved adding six (6) inches of head to both the OR and IR. By noting the drop in head in each infiltrometer at 30 minute increments during the pre-soak, BAI determined that 30-minute testing intervals for TP-2 and TP-3, and 10-minute testing intervals for TP-1, would be used for DRI testing as per the Pennsylvania stormwater Best Management Practices Manual (Document ID 363-0300-002) Appendix C.

Following the pre-soak, test pits TP-1, TP-2, and TP-3 were refilled to a six (6) inch head level in both the IR and OR. Drop in head was measured from a fixed reference point in the IR every 10 minutes for TP-1, and 30 minutes TP-2 and TP-3. The IR and OR were refilled following each reading. Results for DRI tests are discussed in Section 3.0.

Two test pits, TP-3A & TP-4, were completed in May 4, 2020 to characterize soils and identify limiting zones in the Western Terminus Potential. The two test pits were made using an excavator, digging to a depth of 54 inches. Results for limiting zone investigations are discussed in Section 3.0.

[1] http://websoilsurvey.nrcs.usda.gov/app/

3.0 Findings and Conclusions

Based upon examination of each test pit, soils beneath the Site consist of dark brown (10YR 2/2) channery loam to a depth of at least 7 inches. This was located below a thin, approximately 1 to 2 inch layer of organic matter. The soil from 7 to 24 inches consisted of a dark yellowish brown (10YR 4/4) very channery clayey loam. Testing was completed within the same soil series at three locations spread out in the area of the potential BMP location.

For the limiting zone investigation, TP-4 had a limiting zone at the SHWT at 26 inches below grade surface (bgs). TP-3A did not have a limiting zone. Neither test pit encountered bedrock nor a water table.

The following tables summarize the DRI readings for each test pit and the limiting zones identified in each test pit.

		Infiltration Testing Results								
Hole	Reading Interval	Reading 1 (in.)	Reading 2 (in.)	Reading 3 (in.)	Reading 4 (in.)	Reading 5 (in.)	Reading 6 (in.)	Reading 7 (in.)	Reading 8 (in.)	Infiltration Rate (in./hr)
TP1	10 min	0.375	0.375	0.375	0.3125	0.3125	0.375	0.3125		1.97
TP2	30 min	0.25	0.188	0.188	0.188					0.41
TP3	30 min	0.375	0.375	0.375	0.375					0.75

TP-1

The infiltration rate within TP-1 was 1.97 inches per hour (iph) based upon an average rate of drop of 0.328 inches over the last four 10-minute infiltration readings.

TP-2

The infiltration rate within TP-2 was 0.41 inches per hour (iph) based upon an average rate of drop of 0.204 inches over the last four 30-minute infiltration readings.

TP-3

The infiltration rate within TP-3 was 0.75 inches per hour (iph) based upon an average rate of drop of 0.375 inches over the four 30-minute infiltration readings.

Limiting Zone Investigation Results					
Test Pit	Ground Surface Elevation (ft AMSL)	SHWT (in)	Bedrock (in)	Water Table (in)	Total Depth (in)
TP 3A	1685.1	Not Encountered	Not Encountered	Not Encountered	54
TP 4	1684.7	26	Not Encountered	Not Encountered	54

Average Site Infiltration Rate and Discussion

Based upon the results of double-ring infiltration testing completed by BAI, the overall average infiltration rate within the proposed infiltration basin area is 1.04 inches per hour. We feel this rate is representative of the infiltration rate for the HmD soils at depths up to 28-inches, within the proposed infiltration basin area.

References

Pennsylvania Department of Environmental Protection. "Pennsylvania Stormwater Best Management Practices Manual" Document No. 363-0300-02, December 2006.

"Web Soil Survey - Home." Web Soil Survey - Home. United States Department of Agriculture, 6 Dec. 2013. Web. 16 May 2019. <http://websoilsurvey.nrcs.usda.gov/app/>.

INFILTRATION TEST FORM

Project Name: WESTERN TERMINUS INFILTRATION BASIN Date: 5/24/19 Test Completed By: Tony Moscatello_

Weather Conditions: Sunny/70s Soil Conditions: Damp in most areas

Hole No.	Prewet 1 (Drop In.)	Prewet 2 (Drop In.)	Interval Time	Reading No. 1 (Drop In.)	Reading No. 2 (Drop In.)	Reading No. 3 (Drop In.)	Reading No. 4: (Drop In.)	Reading No. 5: (Drop In.)	Reading No. 6: (Drop In.)	Reading No. 7: (Drop In.)	Reading No. 8: (Drop In.)	Average (Drop In.)
1	2.125	2.00	10-min.	0.375	0.375	0.3125	0.3125	0.3125	.03125			**0.375**
2	0.25	0.25	30-min.	0.125	0.125	0.125	0.125					**0.125**
3	0.50	0.25	30-min.	0.125	0.063	0.063	0.063					**0.078**

Notes: Heavily tree covered and small plants. Moderate to steep hillslope dropping to the north. Very stony; rock content between 35-55%, sized up to 6”.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH - HENSEL REPLACEMENT

SOIL TEST PIT LOCATIONS (WESTERN TERMINUS)

CLINTON COUNTY

PENNSYLVANIA

Date:	05/21/20
WHM DRAWING NUMBER:	WILLIAMS200B001_IT
Drawn By:	BWH
Figure Number:	1

ATTACHMENT 4

PCSM PLAN BMP DESIGN WORKSHEETS AND CALCULATIONS

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4.1 Stormwater BMP Manual Appendix D Worksheets- Eastern Terminus MLV

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4.3 Channel Design Worksheets (Standard E&S Worksheet #11) - Eastern Terminus MLV

4.4 Mountable Berm Design Worksheet- Western Terminus MLV

4.5 Culvert Schedule- Eastern Terminus MLV

4.6 Riprap Apron Worksheet- Eastern Terminus MLV

4.7 HydroCAD Report- Eastern Terminus MLV

4.8 HydroCAD Report- Western Terminus MLV

ATTACHMENT 4.1

STORMWATER BMP MANUAL APPENDIX D WORKSHEETS- EASTERN TERMINUS MLV

Appendix D. Worksheets- Hensel Replacement Eastern Terminus Main Line Valve and Access Road

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 8/9/2019

Project Name: Leidy South – Hensel Replacement Eastern Terminus Main Line Valve and Access Road

Municipality: Township of Chapman

County: Clinton

Total Area (acres): 5.44

Major River Basin: Susquehanna River

Watershed: Middle West Branch Susquehanna

Sub-Basin: Mudlick Run

Nearest Surface Water(s) to Receive Runoff: Mudlick Run

Chapter 93 – Designated Water Use/Existing Water Use: EV, MF

Impaired according to Category 4 or 5 of the Integrated Water Quality Monitoring and Assessment Report? Yes ☐ No ☒

List Causes of Impairment:

Is there an established TMDL that applies: Yes ☐ No ☒

Total Maximum Daily Loads (TMDLS)

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☒

Existing or planned drinking water supply? Yes ☐ No ☒

If yes, distance from proposed discharge (miles):

Approved Act 167 Plan? Yes ☐ No ☒

Existing River Conservation Plan? Yes ☐ No ☒

Worksheet 2. Sensitive Natural Resources from PA Stormwater Best Management Practices Chapter 5

INSTRUCTIONS

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	n/a		
Floodplains	n/a		
Riparian Areas	n/a		
Wetlands	n/a		
Woodlands	yes	0.96	
Natural Drainage Ways	n/a		
Steep Slopes, 15% - 25%	n/a		
Steep Slopes, over 25%	n/a		
Other:	n/a		
Other:	n/a		
TOTAL EXISTING:		**0.96**	**0**

Worksheet 3. Nonstructural BMP Credits from PA Stormwater Best Management Practices Manual (SW BMP Manual)

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) _____ **Ac.**

1.2 Area of Riparian Forest Buffer Protection (see WS 2) _____ **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading (See Chapter 8, page 21 – SW BMP Manual) _____ **Ac**

TOTAL 0 **Ac**

Site Area	Minus	Protected Area	=	Stormwater Management Area
5.44	-	0	=	5.44

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction (See Chapter 8, page 22 – SW BMP Manual)

Lawn _____ ft^2 x 1/4" x 1/12 = _____ ft^3

_____

Meadow _____ ft^2 x 1/3" x 1/12 = _____ ft^3

3.3 Protect Existing Trees (See Chapter 8, page 23 – SW BMP Manual)

For Trees within 100 feet of impervious area:

Tree Canopy _____ ft^2 x 1/2" x 1/12 = _____ ft^3

_____ _____

5.1 Disconnect Roof Leaders to Vegetated Areas (See Chapter 8 page 25 – SW BMP Manual)

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Roof Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

5.2 Disconnect Non-Roof impervious to Vegetated Areas (See Chapter 8, page 26 – SW BMP Manual)

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Impervious Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

TOTAL NON-STRUCTURAL VOLUME CREDIT* _____ ft

**For use on Worksheet 5*

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Leidy South – Hensel Replacement Eastern Terminus Main Line Valve and Access Road
Drainage Area: 5.44 acres
2-Year Rainfall: 2.58 in

Total Site Area: 5.44 acres
Protected Site Area: 0 acres
Managed Area: 5.44 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woodland	HmD/B	120,281	2.76	60	6.67	1.33	0.20	1,969
Meadow	HmD/B	116,758	2.68	58	7.24	1.45	0.15	1,488
TOTAL:		237,039	5.44				0.35	3,457

Developed Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woodland	HmD/B	114,752	2.63	60	6.67	1.33	0.20	1878
Impervious	HmD/B	37,930	0.87	89	1.24	0.25	1.52	4,820
Meadow	HmD/B	84,357	1.94	58	7.24	1.45	0.15	1,075
TOTAL:		237,039	5.44				1.87	7,773

2-Year Volume Increase (ft3): 4,316

2-Year Volume Increase = Developed Conditions Runoff Volume – Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 5. Structural BMP Volume Credits

PROJECT: Leidy South – Hensel Replacement Eastern Terminus Main Line Valve and Access Road
SUB-BASIN: Mudlick Run

Required Control Volume (ft^3) – *from Worksheet 4*: 4,314

Non-structural Volume Credit (ft^3) – *from Worksheet 3*: - 0
(maximum is 25% of required volume)

Structural Volume Reqmt (ft^3) 4,314

(Required Control Volume minus Non-structural Credit)

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 6		Area (ft^2)	Volume Reduction Permanently Removed (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale	1,000	10,932
6.4.9	Vegetated Filter Strip		
6.4.10	Berm	3,750	6,447
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.7.1	Riparian Buffer/Riparian Forest Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): 17,379
Structural Volume Requirement (ft^3): 4,314
DIFFERENCE 13,065

Stormwater BMP Manual Appendix D. Worksheets
Hensel Replacement Eastern Terminus Main Line Valve and Access Road

Worksheet 10 – Water Quality Compliance for Nitrate		
Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the equivalent) "provided across the site" is taken to mean the specifications for that BMP set forward in Sections 5 and 6 are satisfied. Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 5 & 6		
	Yes	**No**
Primary BMPs for Nitrate:	☐	☐
NS BMP 5.4.2 – Protect/Conserve/Enhance Riparian Buffers	☐	☐
NS BMP 5.5.4 – Cluster Uses at Each Site	☐	☐
NS BMP 5.6.1 – Minimize Total Disturbed Area	☒	☐
NS BMP 5.6.3 – Re-Vegetate/Re-Forest Disturbed Areas (Native Species)	☒	☐
NS BMP 5.9.1 – Street Sweeping/Vacuuming	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
	☐	☐
Secondary BMPs for Nitrate:	☐	☐
NS BMP 5.4.1 – Protect Sensitive/Special Value Features	☐	☐
NS BMP 5.4.3 – Protect/Utilize Natural Drainage Features	☒	☐
NS BMP 5.6.2 – Minimize Soil Compaction	☐	☐
Structural BMP 6.4.5 – Rain Garden/Bioretention	☐	☐
Structural BMP 6.4.8 – Vegetated Swale	☒	☐
Structural BMP 6.4.9 – Vegetated Filter Strip	☐	☐
Structural BMP 6.6.1 – Constructed Wetland	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
Structural BMP 6.7.3 – Soil Amendment/Restoration	☐	☐

ATTACHMENT 4.2

STORMWATER BMP MANUAL APPENDIX D WORKSHEETS- WESTERN TERMINUS MLV

Stormwater BMP Manual Appendix D. Worksheets
Hensel Replacement Western Terminus Main Line Valve

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 8/9/2019

Project Name: Leidy South – Hensel Replacement Western Terminus Main Line Valve

Municipality: Township of Leidy

County: Clinton

Total Area (acres): 7.80

Major River Basin: Susquehanna River

Watershed: West Branch Susquehanna

Sub-Basin: Turtle Point Hollow

Nearest Surface Water(s) to Receive Runoff: Turtle Point Hollow

Chapter 93 – Designated Water Use/Existing Water Use: EV, MF

Impaired according to Category 4 or 5 of the Integrated Water Quality Monitoring and Assessment Report? Yes ☐ No ☒

List Causes of Impairment:

Is there an established TMDL that applies: Yes ☐ No ☒

Total Maximum Daily Loads (TMDLS)

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☒

Existing or planned drinking water supply? Yes ☐ No ☒

If yes, distance from proposed discharge (miles):

Approved Act 167 Plan? Yes ☐ No ☒

Existing River Conservation Plan? Yes ☐ No ☒

Worksheet 2. Sensitive Natural Resources from PA Stormwater Best Management Practices Chapter 5

INSTRUCTIONS

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	n/a		
Floodplains	n/a		
Riparian Areas	n/a		
Wetlands	n/a		
Woodlands	yes	0.75	
Natural Drainage Ways	n/a		
Steep Slopes, 15% - 25%	n/a		
Steep Slopes, over 25%	n/a		
Other:	n/a		
Other:	n/a		
TOTAL EXISTING:		**0.75**	**0**

Worksheet 3. Nonstructural BMP Credits from PA Stormwater Best Management Practices Manual (SW BMP Manual)

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) _____ **Ac.**

1.2 Area of Riparian Forest Buffer Protection (see WS 2) _____ **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading (See Chapter 8, page 21 – SW BMP Manual) _____ **Ac**

TOTAL 0 **Ac**

Site Area	Minus	Protected Area	=	Stormwater Management Area
7.80	-	0	=	7.80

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction (See Chapter 8, page 22 – SW BMP Manual)

Lawn _____ ft^2 x 1/4" x 1/12 = _____ ft^3

_____

Meadow _____ ft^2 x 1/3" x 1/12 = _____ ft^3

3.3 Protect Existing Trees (See Chapter 8, page 23 – SW BMP Manual)

For Trees within 100 feet of impervious area:

Tree Canopy _____ ft^2 x 1/2" x 1/12 = _____ ft^3

_____ _____

5.1 Disconnect Roof Leaders to Vegetated Areas (See Chapter 8 page 25 – SW BMP Manual)

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Roof Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

5.2 Disconnect Non-Roof impervious to Vegetated Areas (See Chapter 8, page 26 – SW BMP Manual)

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Impervious Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

TOTAL NON-STRUCTURAL VOLUME CREDIT* _____ ft

**For use on Worksheet 5*

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Leidy South – Hensel Replacement Western Terminus Main Line Valve
Drainage Area: 7.80 ac
2-Year Rainfall: 2.58 in

Total Site Area: 7.80 acres
Protected Site Area: 0 acres
Managed Area: 7.80 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Meadow	UpF/B	184,091	4.23	58	7.24	1.45	0.15	2,347
Woodland	UpF/B	130,502	3.00	60	6.67	1.33	0.20	2,136
Impervious	UpF/B	21,900	0.50	89	1.24	0.25	1.52	2,783
TOTAL:		339,800	7.80				1.87	7,265

Developed Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Meadow	UpF/B	184,091	4.23	58	7.24	1.45	0.15	2,347
Woodland	UpF/B	130,502	3.00	60	6.67	1.33	0.20	2,136
Impervious	UpF/B	25,207	0.58	89	1.24	0.25	1.52	3,203
TOTAL:		339,800	7.80				1.87	7,686

2-Year Volume Increase (ft3): 420

2-Year Volume Increase = Developed Conditions Runoff Volume – Existing Conditions Runoff Volume

1. Runoff (in) = Q = $(P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 5. Structural BMP Volume Credits

PROJECT: Leidy South – Hensel Replacement Western Terminus Main Line Valve
SUB-BASIN: Turtle Point Hollow

Required Control Volume (ft^3) – *from Worksheet 4*: 420

Non-structural Volume Credit (ft^3) – *from Worksheet 3*: - 0
(maximum is 25% of required volume)

Structural Volume Reqmt (ft^3) 420

(Required Control Volume minus Non-structural Credit)

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 6		Area (ft^2)	Volume Reduction Permanently Removed (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm	4,621	8,058
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.7.1	Riparian Buffer/Riparian Forest Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment	4,621	192
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): 8,250
Structural Volume Requirement (ft^3): 420
DIFFERENCE 7,830

Stormwater BMP Manual Appendix D. Worksheets
Hensel Replacement Western Terminus Main Line Valve and Access Road

Worksheet 10 – Water Quality Compliance for Nitrate		
Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the equivalent) "provided across the site" is taken to mean the specifications for that BMP set forward in Sections 5 and 6 are satisfied. Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 5 & 6		
	Yes	**No**
Primary BMPs for Nitrate:	☐	☐
NS BMP 5.4.2 – Protect/Conserve/Enhance Riparian Buffers	☐	☐
NS BMP 5.5.4 – Cluster Uses at Each Site	☐	☐
NS BMP 5.6.1 – Minimize Total Disturbed Area	☒	☐
NS BMP 5.6.3 – Re-Vegetate/Re-Forest Disturbed Areas (Native Species)	☒	☐
NS BMP 5.9.1 – Street Sweeping/Vacuuming	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
	☐	☐
Secondary BMPs for Nitrate:	☐	☐
NS BMP 5.4.1 – Protect Sensitive/Special Value Features	☐	☐
NS BMP 5.4.3 – Protect/Utilize Natural Drainage Features	☒	☐
NS BMP 5.6.2 – Minimize Soil Compaction	☐	☐
Structural BMP 6.4.5 – Rain Garden/Bioretention	☐	☐
Structural BMP 6.4.8 – Vegetated Swale	☐	☐
Structural BMP 6.4.9 – Vegetated Filter Strip	☐	☐
Structural BMP 6.6.1 – Constructed Wetland	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
Structural BMP 6.7.3 – Soil Amendment/Restoration	☒	☐

ATTACHMENT 4.3

CHANNEL DESIGN WORKSHEETS-
EASTERN TERMINUS MLV

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South-Hensel Replacement Eastern Terminus Main Line Valve and Access Road

Prepared by: FJ, 8/2019

LOCATION: Chapman Township, Clinton County, PA

Checked by: KCC, 8/2019

CHANNEL OR CHANNEL SECTION		HR-28	HR-28	HR-29	HR-29
TEMPORARY OR PERMANENT?	(T OR P)	P	P	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	0.862	0.862	0.441	0.441
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	0.75	0.75	0.89	0.89
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	1.1	1.5	1.9	2.1
PROTECTIVE LINING[2]		ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM
n (MANNING'S COEFFICIENT)[2]		0.04	0.06	0.04	0.06
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.2	1.9	2.4	1.9
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.5	8	2.5	8
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.5	0.7	0.6	0.7
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2
D (TOTAL DEPTH)	(FT)	0.75	1.00	1.00	1.00
CHANNEL TOP WIDTH @ D	(FT)	5	6	6	6
d (CALCULATED FLOW DEPTH)	(FT)	0.2	0.3	0.3	0.4
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.8	3.2	3.2	3.6
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	10	6.67	6.67	5
d_{50} STONE SIZE	(IN)	N/A	N/A	N/A	N/A
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.48	0.78	0.78	1.12
R (HYDRAULIC RADIUS)		0.166	0.233	0.233	0.296
S (BED SLOPE)[3]	(FT/FT)	0.04	0.04	0.03	0.03
S_c (CRITICAL SLOPE)	(FT/FT)	0.044	0.089	0.039	0.083
$.7S_c$	(FT/FT)	0.0308	0.0623	0.0273	0.0581
$1.3S_c$	(FT/FT)	0.0572	0.1157	0.0507	0.1079
STABLE FLOW?	(Y/N)	N	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.05	N/A	0.075	N/A
FREEBOARD BASED ON STABLE FLOW	(FT)	N/A	0.075	N/A	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR-30	HR-30
TEMPORARY OR PERMANENT?	(T OR P)	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr
ACRES	(AC)	0.138	0.138
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	0.67	0.67
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.2	1.5
PROTECTIVE LINING[2]		ECM (SC250)	Vegetated ECM
n (MANNING'S COEFFICIENT)[2]		0.04	0.06
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.8	1.9
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.5	8
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.7	0.7
CHANNEL BOTTOM WIDTH	(FT)	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2
D (TOTAL DEPTH)	(FT)	1	1.00
CHANNEL TOP WIDTH @ D	(FT)	6	6
d (CALCULATED FLOW DEPTH)	(FT)	0.3	0.3
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.2	3.2
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	6.67	6.67
d_{50} STONE SIZE	(IN)	N/A	N/A
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.78	0.78
R (HYDRAULIC RADIUS)		0.233	0.233
S (BED SLOPE)[3]	(FT/FT)	0.04	0.04
S_c (CRITICAL SLOPE)	(FT/FT)	0.039	0.089
$.7S_c$	(FT/FT)	0.0273	0.0623
$1.3S_c$	(FT/FT)	0.0507	0.1157
STABLE FLOW?	(Y/N)	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.075	N/A
FREEBOARD BASED ON STABLE FLOW	(FT)	N/A	0.075
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

*

HYDROCAD CHANNEL PEAK FLOW CALCULATIONS

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 7S: HL-28 Runoff Area=37,554 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=471' Tc=17.4 min CN=65 Runoff=0.75 cfs 2,308 cf

Subcatchment 8S: HL-29 Runoff Area=19,203 sf 0.00% Impervious Runoff Depth>1.54"
Flow Length=471' Tc=17.4 min CN=79 Runoff=0.89 cfs 2,472 cf

Subcatchment 9S: HL-30 Runoff Area=6,000 sf 0.00% Impervious Runoff Depth>2.34"
Flow Length=25' Slope=0.0500 '/' Tc=0.1 min CN=89 Runoff=0.67 cfs 1,172 cf

Total Runoff Area = 62,757 sf Runoff Volume = 5,952 cf Average Runoff Depth = 1.14"
100.00% Pervious = 62,757 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 7S: HL-28

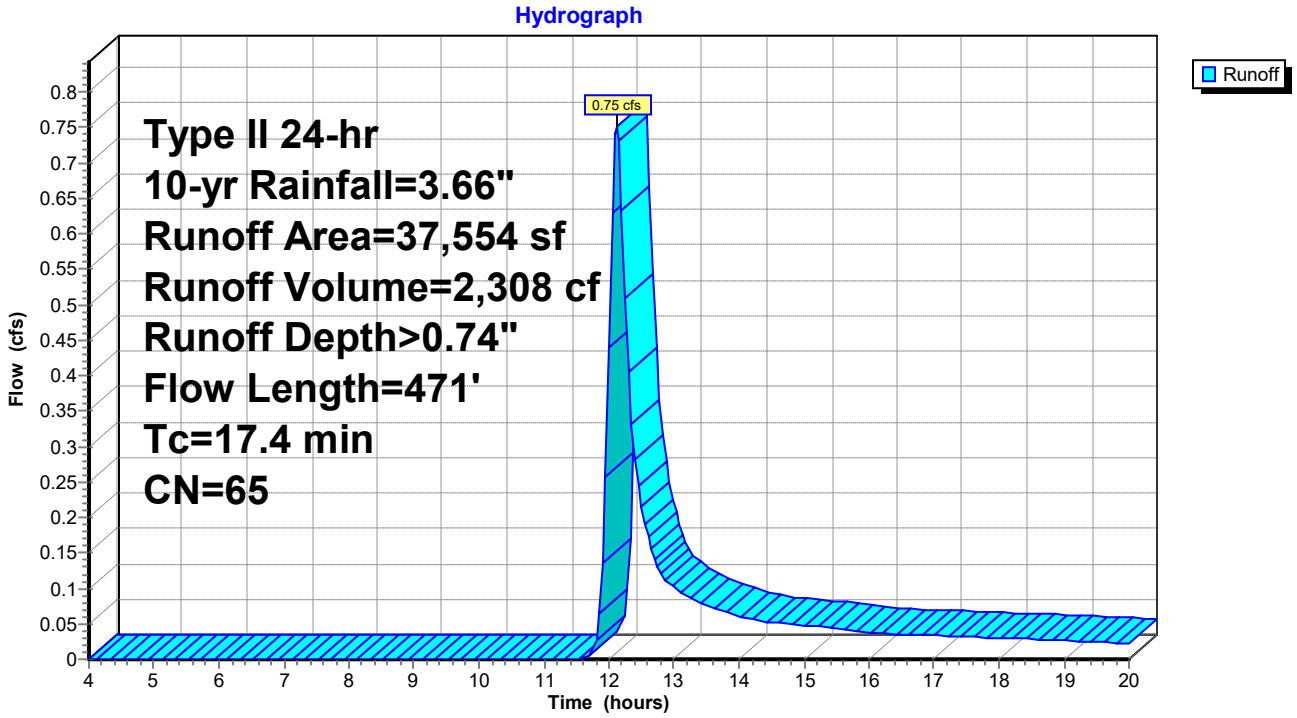
Runoff = 0.75 cfs @ 12.12 hrs, Volume= 2,308 cf, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (sf)	CN	Description
7,087	89	Gravel roads, HSG C
23,217	60	Woods, Fair, HSG B
7,250	58	Meadow, non-grazed, HSG B
37,554	65	Weighted Average
37,554		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: HL-28



Hydrograph for Subcatchment 7S: HL-28

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00
4.25	0.19	0.00	0.00
4.50	0.20	0.00	0.00
4.75	0.22	0.00	0.00
5.00	0.23	0.00	0.00
5.25	0.25	0.00	0.00
5.50	0.26	0.00	0.00
5.75	0.28	0.00	0.00
6.00	0.29	0.00	0.00
6.25	0.31	0.00	0.00
6.50	0.33	0.00	0.00
6.75	0.34	0.00	0.00
7.00	0.36	0.00	0.00
7.25	0.38	0.00	0.00
7.50	0.40	0.00	0.00
7.75	0.42	0.00	0.00
8.00	0.44	0.00	0.00
8.25	0.46	0.00	0.00
8.50	0.48	0.00	0.00
8.75	0.51	0.00	0.00
9.00	0.54	0.00	0.00
9.25	0.57	0.00	0.00
9.50	0.60	0.00	0.00
9.75	0.63	0.00	0.00
10.00	0.66	0.00	0.00
10.25	0.70	0.00	0.00
10.50	0.75	0.00	0.00
10.75	0.80	0.00	0.00
11.00	0.86	0.00	0.00
11.25	0.94	0.00	0.00
11.50	1.04	0.00	0.00
11.75	1.42	0.02	0.01
12.00	2.43	0.27	**0.44**
12.25	2.58	0.33	**0.51**
12.50	2.69	0.37	0.21
12.75	2.76	0.40	0.13
13.00	2.83	0.43	0.10
13.25	2.88	0.45	0.09
13.50	2.92	0.47	0.08
13.75	2.97	0.49	0.07
14.00	3.00	0.51	0.06
14.25	3.03	0.52	0.06
14.50	3.07	0.54	0.05
14.75	3.10	0.55	0.05
15.00	3.12	0.56	0.05
15.25	3.15	0.58	0.05
15.50	3.18	0.59	0.04
15.75	3.20	0.60	0.04
16.00	3.22	0.61	0.04
16.25	3.24	0.62	0.04
16.50	3.26	0.63	0.04
16.75	3.28	0.64	0.03
17.00	3.30	0.65	0.03
17.25	3.32	0.66	0.03
17.50	3.34	0.67	0.03
17.75	3.35	0.68	0.03
18.00	3.37	0.69	0.03
18.25	3.39	0.69	0.03
18.50	3.40	0.70	0.03
18.75	3.42	0.71	0.03
19.00	3.43	0.72	0.03
19.25	3.45	0.72	0.03
19.50	3.46	0.73	0.02
19.75	3.47	0.74	0.02
20.00	**3.48**	**0.74**	0.02

Summary for Subcatchment 8S: HL-29

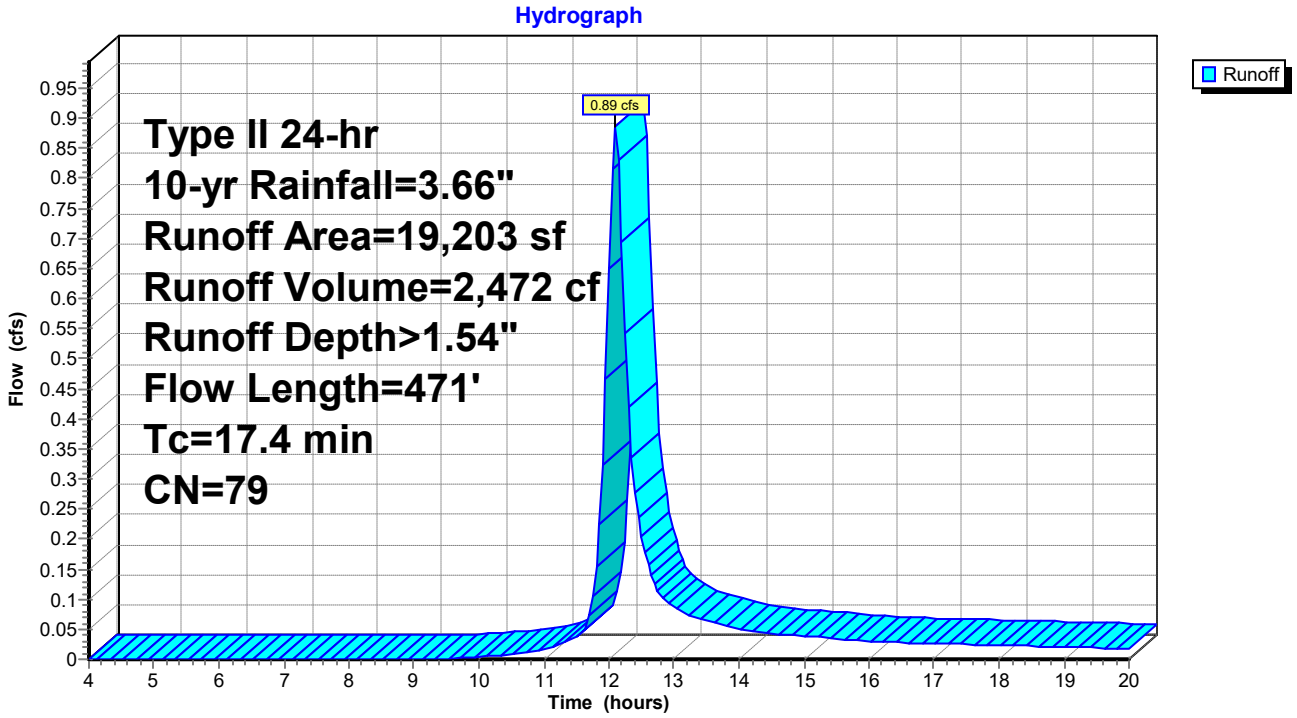
Runoff = 0.89 cfs @ 12.10 hrs, Volume= 2,472 cf, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (sf)	CN	Description
12,683	89	Gravel roads, HSG C
3,773	60	Woods, Fair, HSG B
2,747	58	Meadow, non-grazed, HSG B
19,203	79	Weighted Average
19,203		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 8S: HL-29



Hydrograph for Subcatchment 8S: HL-29

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00
4.25	0.19	0.00	0.00
4.50	0.20	0.00	0.00
4.75	0.22	0.00	0.00
5.00	0.23	0.00	0.00
5.25	0.25	0.00	0.00
5.50	0.26	0.00	0.00
5.75	0.28	0.00	0.00
6.00	0.29	0.00	0.00
6.25	0.31	0.00	0.00
6.50	0.33	0.00	0.00
6.75	0.34	0.00	0.00
7.00	0.36	0.00	0.00
7.25	0.38	0.00	0.00
7.50	0.40	0.00	0.00
7.75	0.42	0.00	0.00
8.00	0.44	0.00	0.00
8.25	0.46	0.00	0.00
8.50	0.48	0.00	0.00
8.75	0.51	0.00	0.00
9.00	0.54	0.00	0.00
9.25	0.57	0.00	0.00
9.50	0.60	0.00	0.00
9.75	0.63	0.00	0.00
10.00	0.66	0.01	0.00
10.25	0.70	0.01	0.01
10.50	0.75	0.02	0.01
10.75	0.80	0.02	0.01
11.00	0.86	0.04	0.02
11.25	0.94	0.05	0.02
11.50	1.04	0.08	0.04
11.75	1.42	0.22	0.11
12.00	2.43	0.79	**0.65**
12.25	2.58	0.89	**0.54**
12.50	2.69	0.97	0.20
12.75	2.76	1.02	0.12
13.00	2.83	1.06	0.09
13.25	2.88	1.10	0.07
13.50	2.92	1.13	0.06
13.75	2.97	1.16	0.06
14.00	3.00	1.19	0.05
14.25	3.03	1.21	0.05
14.50	3.07	1.24	0.04
14.75	3.10	1.26	0.04
15.00	3.12	1.28	0.04
15.25	3.15	1.30	0.04
15.50	3.18	1.32	0.03
15.75	3.20	1.34	0.03
16.00	3.22	1.35	0.03
16.25	3.24	1.37	0.03
16.50	3.26	1.38	0.03
16.75	3.28	1.40	0.03
17.00	3.30	1.41	0.03
17.25	3.32	1.43	0.03
17.50	3.34	1.44	0.02
17.75	3.35	1.45	0.02
18.00	3.37	1.47	0.02
18.25	3.39	1.48	0.02
18.50	3.40	1.49	0.02
18.75	3.42	1.50	0.02
19.00	3.43	1.51	0.02
19.25	3.45	1.52	0.02
19.50	3.46	1.53	0.02
19.75	3.47	1.54	0.02
20.00	**3.48**	**1.55**	0.02

Summary for Subcatchment 9S: HL-30

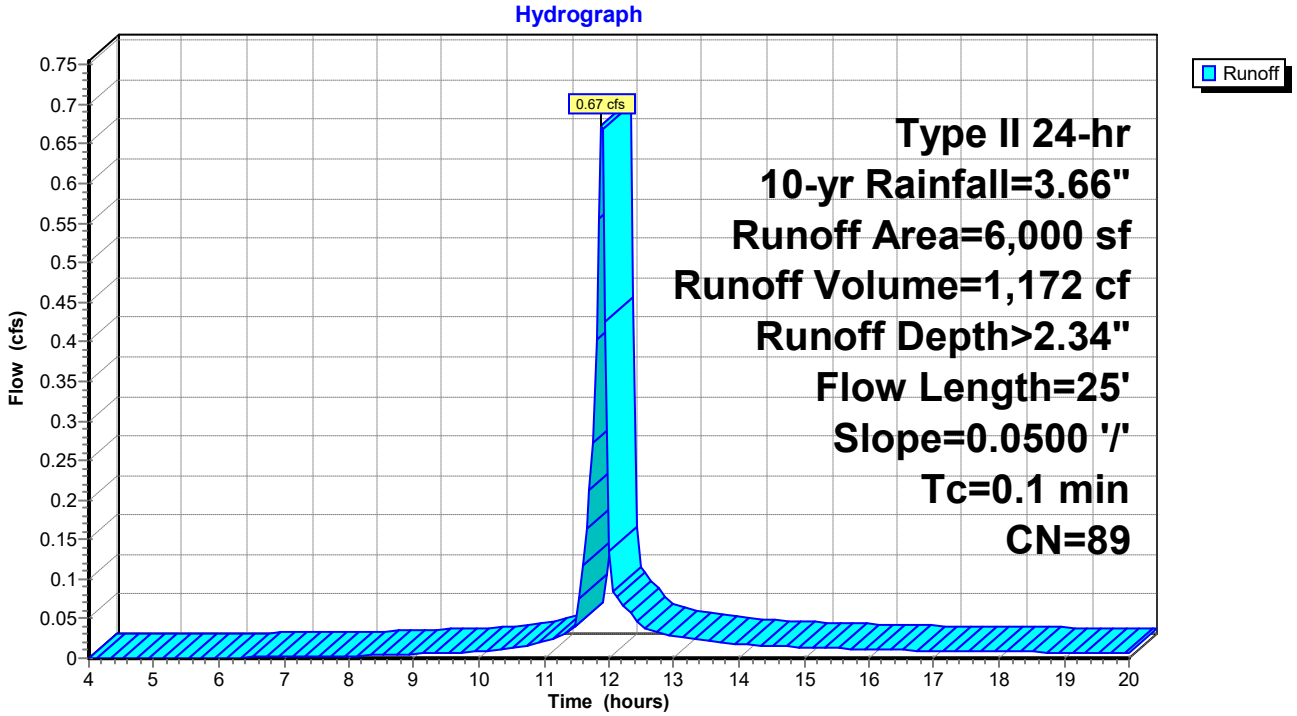
Runoff = 0.67 cfs @ 11.89 hrs, Volume= 1,172 cf, Depth> 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (sf)	CN	Description
6,000	89	Gravel roads, HSG C
6,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	25	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 9S: HL-30



Hydrograph for Subcatchment 9S: HL-30

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00
4.25	0.19	0.00	0.00
4.50	0.20	0.00	0.00
4.75	0.22	0.00	0.00
5.00	0.23	0.00	0.00
5.25	0.25	0.00	0.00
5.50	0.26	0.00	0.00
5.75	0.28	0.00	0.00
6.00	0.29	0.00	0.00
6.25	0.31	0.00	0.00
6.50	0.33	0.00	0.00
6.75	0.34	0.01	0.00
7.00	0.36	0.01	0.00
7.25	0.38	0.01	0.00
7.50	0.40	0.02	0.00
7.75	0.42	0.02	0.00
8.00	0.44	0.03	0.00
8.25	0.46	0.03	0.00
8.50	0.48	0.04	0.00
8.75	0.51	0.05	0.00
9.00	0.54	0.06	0.01
9.25	0.57	0.07	0.01
9.50	0.60	0.08	0.01
9.75	0.63	0.09	0.01
10.00	0.66	0.10	0.01
10.25	0.70	0.12	0.01
10.50	0.75	0.14	0.01
10.75	0.80	0.17	0.02
11.00	0.86	0.20	0.02
11.25	0.94	0.25	0.03
11.50	1.04	0.31	0.04
11.75	1.42	0.57	**0.27**
12.00	2.43	1.39	**0.13**
12.25	2.58	1.53	0.06
12.50	2.69	1.62	0.04
12.75	2.76	1.69	0.03
13.00	2.83	1.74	0.03
13.25	2.88	1.79	0.02
13.50	2.92	1.83	0.02
13.75	2.97	1.87	0.02
14.00	3.00	1.90	0.02
14.25	3.03	1.93	0.02
14.50	3.07	1.96	0.02
14.75	3.10	1.99	0.01
15.00	3.12	2.01	0.01
15.25	3.15	2.04	0.01
15.50	3.18	2.06	0.01
15.75	3.20	2.08	0.01
16.00	3.22	2.10	0.01
16.25	3.24	2.12	0.01
16.50	3.26	2.14	0.01
16.75	3.28	2.16	0.01
17.00	3.30	2.17	0.01
17.25	3.32	2.19	0.01
17.50	3.34	2.21	0.01
17.75	3.35	2.22	0.01
18.00	3.37	2.24	0.01
18.25	3.39	2.25	0.01
18.50	3.40	2.27	0.01
18.75	3.42	2.28	0.01
19.00	3.43	2.29	0.01
19.25	3.45	2.31	0.01
19.50	3.46	2.32	0.01
19.75	3.47	2.33	0.01
20.00	**3.48**	**2.34**	0.01

CHANNEL LINING-
MANUFACTURER'S SPECIFICATIONS

ROLLMAX™
ROLLED EROSION CONTROL

ROLLED
EROSION CONTROL

SYSTEMS BROCHURE

Tensar®

When It Rains (or Blows, Flows or Washes), It Pours

Erosion not only wears away slopes, degrades shorelines and steals precious topsoil, it can also threaten water sources, damage man-made structures, reconfigure landscapes and disrupt wildlife habitats. Add the stiff penalties at stake for violating Environmental Protection Agency (EPA) or local enforcement agency regulations, and the costs of erosion can quickly climb out of control.

WE ROLL AGAINST THE FLOW

Tensar International Corporation (Tensar) is the world's leading provider of performance-guaranteed erosion control solutions. For more than 25 years, the Tensar® North American Green® line of erosion and sediment control products has kept our customers on solid ground.

The RollMax™ Systems' family of Rolled Erosion Control Products (RECPs) is solid evidence of Tensar's ongoing investment in innovation. Our short-term and long-term erosion control blankets and turf reinforcement mats keep you one step ahead of just about any erosion challenge.

ALL THE HELP YOU NEED

Of all the RECP manufacturers out there, none can match Tensar's customer service and technical knowhow. Our support team will assist with project design and product specification or, if you'd rather do it yourself, use our Erosion Control Materials Design Software (ECMDS®) (the industry's first) for selecting material, and planning your project.

Tensar products are sold exclusively through nearly 200 Tensar Erosion Control authorized distributors worldwide. The Tensar Erosion Solutions Specialist program certifies our distributors and their sales representatives to design erosion control measures that comply with the EPA's National Pollutant Discharge Elimination System (NPDES) and other industry regulations.

Tensar is a proud member of the Erosion Control Technology Council (ECTC) and the International Erosion Control Association (IECA).

NEW NAME – SAME GREAT PERFORMANCE AND SERVICE

Tensar International Corporation acquired North American Green (NAG) in 2004 to enhance our position as the premier provider of technology-driven site solutions. We are proud to continue offering the same NAG level of service, quality and high-performance erosion control products under the name of Tensar.

Site erosion can be costly, with the RollMax Systems full line of rolled erosion control products we can keep you in compliance.

For more than 25 years, our Tensar North American Green line of products has kept our customers on solid ground.

Applications Welcome

For nearly every erosion application, there's a RollMax™ Systems solution. Permanent turf reinforcement mats provide long-term protection and vegetation establishment; temporary Erosion Control Blankets (ECBs) give immediate protection and assist with vegetation establishment before degrading naturally. Tensar's extensive selection of RollMax products almost guarantees you'll find the answer to your erosion problems.

Typical erosion control applications include these and many more:

- Highway and other DOT projects
- Commercial and residential developments
- Shorelines and waterways
- Golf course turf management
- Oil and gas pipeline restoration
- Mine and fire reclamation
- Military base construction

AND SPEAKING OF GUARANTEES . . .

Tensar's Ultimate Assurance Guarantee is the most comprehensive in the industry. It says if any properly specified and installed Tensar® North American Green® rolled erosion control product designed by a qualified engineer or Tensar technical representative in accordance with our Erosion Control Materials Design Software (ECMDS®) fails to perform under the conditions in the Guarantee, then we will replace the failed product with our next higher-performance RECP product, along with the cost of seed, fertilizer, topsoil and other amendments lost due to such product failure. Our Guarantee warrants in accordance with its terms and conditions all registered projects designed with the latest version of our ECMDS and properly installed.

Tensar turf reinforcement mats are also guaranteed to reinforce vegetation for five years after installation, and the functional longevity of these products' permanent structures is warranted for a minimum of 10 years after installation, subject to the terms and conditions set forth in the Guarantee.

From challenging roadway improvements to concentrated flow channels, there is a RollMax product ready to handle the job – and it's guaranteed.

Permanent RollMax™ Solutions

Back in the day, rock riprap, articulated concrete blocks and poured concrete were the only way to deal with erosion in high-flow channels, on shorelines and other areas where water and/or wind exceed the shear limits of unreinforced vegetation.

Not anymore. Tensar's permanent Turf Reinforcement Mats (TRMs) use 100% synthetic components or a composite of synthetic and natural materials for long-term erosion protection and vegetation establishment. Whether compared to rock riprap or concrete, the RollMax™ Systems' permanent TRMs offer a number of significant advantages:

- Prevent loss of precious topsoil to wind and water erosion
- Permanently reinforce vegetation root and stem structures
- Provide excellent conditions for quick, healthy vegetation growth
- Stabilize slopes from erosion to keep roadways safe and clean
- Protect water quality in lakes, rivers and streams
- Protect dormant seeding during winter months
- Easily conform to landscape features
- Lightweight for easy handling and transportation

VMAX® COMPOSITE TURF REINFORCEMENT MATS

VMax® C-TRMs combine three-dimensional matting with fiber matrix material for permanent erosion control on severe slopes, spillways, stream banks, shorelines and in high- to extreme-flow channels. These extensively tested products provide maximum performance through all three phases of reinforced vegetative lining development: unvegetated, establishment, and maturity. Incorporating the best performance features of temporary and permanent Tensar erosion control products, VMax C-TRMs deliver these tangible benefits:

- Surface-applied for the highest level of immediate soil protection
- Less than one third of the installed cost of rock or concrete
- No heavy equipment needed to install
- More attractive and effective "Green" alternative than rock riprap or concrete
- Exceeds FHWA and ECTC standards for TRMs
- An EPA Best Management Practice (BMP) for National Pollutant Discharge Elimination System (NPDES) regulations
- No threat to pedestrians or automobiles when used near travel routes
- Naturally filters runoff water

The TRMs easily conform to various landscape features to prevent the loss of precious topsoil.

The RollMax TRMs are installed in a one-step operation directly over the prepared seedbed saving time and money and ensuring the highest level of erosion control and vegetation reinforcement.

VMax® P550® Permanent TRM

Our top of the line P550® TRM has a polypropylene fiber matrix augmenting the permanent netting structure with permanent mulching and erosion control performance. Unvegetated, the P550 TRM reduces soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 4.0 lbs/ft^2 (191 Pa). The ultra-strong structure drives the vegetated shear resistance up to 14 lbs/ft^2 (672 Pa), establishing a new maximum for vegetation reinforcement. The P550 TRM may be used as an alternative for poured concrete or articulated concrete blocks in extreme erosion control projects.

VMax® C350® Permanent TRM

A 100% coconut fiber matrix supplements the C350's permanent three-dimensional netting structure with initial mulching and erosion control performance for up to 36 months. Unvegetated, the C350® TRM reduces soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.2 lbs/ft^2 (153 Pa) and boosts permanent vegetation performance up to 12 lbs/ft^2 (576 Pa). This environmentally friendly alternative to 30 in. (76 cm) or larger rock riprap is ideal for severe erosion control projects.

VMax® SC250® Permanent TRM

The SC250® permanent TRM has a 70% straw/30% coconut fiber matrix to enhance initial mulching and erosion control performance for up to 24 months. Unvegetated, SC250 TRMs reduce soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.0 lbs/ft^2, and increases permanent vegetation performance up to 10 lbs/ft^2 (480 Pa) for a green alternative to rock riprap.

ERONET™ PERMANENT EROSION CONTROL BLANKETS

The EroNet™ Permanent ECB provides immediate erosion protection and vegetation establishment assistance until vegetation roots and stems mature.

EroNet™ P300® Permanent Erosion Control Blankets

The P300® permanent erosion control blanket consists of UV-stabilized polypropylene fiber stitched between heavy-weight UV-stabilized polypropylene top and bottom nets. These mats reduce soil loss and protect vegetation from being washed away or uprooted, even under high stress. Unvegetated, they reduce soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.0 lbs/ft^2 (144 Pa), and protect vegetation from being washed away or uprooted when exposed to shear stresses up to 8 lbs/ft^2 (383 Pa).

To boost performance of the VMax turf reinforcement mats in critical applications, combine with our ShoreMax® flexible transition mat to create a system that can dramatically elevate the permissible shear stress and velocity protection beyond many hard armor solutions.

VMax Mats are perfect for pipe outlets, channel bottoms, shoreline transition zones, and other areas subjected to highly turbulent water flows.

Temporary RollMax™ Solutions

Erosion control has never been so simple yet effective. Tensar's RollMax™ temporary Erosion Control Blankets (ECBs) provide immediate erosion protection and vegetation establishment assistance, then degrade once the vegetation's root and stem systems are mature enough to stabilize the soil.

Our high-quality temporary solutions are available in varying functional longevities and materials:

- Short-term photodegradable blankets with a functional longevity of 45 days up to 12 months
- Extended-term and long-term photodegradable blankets for protection up to 36 months
- Short-term biodegradable blankets for protection up to 12 months
- Extended-term and long-term biodegradable products for protection and mulching from 18 to 24 months

ERONET™ EROSION CONTROL BLANKETS

Tensar's EroNet™ ECBs incorporate photodegradable nettings, which means they are broken down by the ultraviolet rays in sunlight. These temporary products can be used in a variety of scenarios, including moderate to steep slopes, medium- to high-flow channels, shorelines and other areas needing protection until permanent vegetation establishment.

EroNet™ C125® Long-Term Photodegradable Double-Net Coconut Blanket

The C125® ECB is made of 100% coconut fiber stitched between heavyweight UV-stabilized polypropylene nets. It offers excellent durability, erosion control and longevity for severe slopes, steep embankments, high-flow channels and other areas where vegetation may take up to 36 months to grow in.

The EroNet temporary ECBs are designed to provide immediate erosion protection and vegetation establishment assistance, and then degrade after the vegetation is mature enough to permanently stabilize the underlying soil. Both short-term and extended-term ECBs are available.

EroNet™ SC150® Extended-Term Photodegradable Double-Net Straw/Coconut Blanket

With a layer of 70% straw and 30% coconut fiber stitched between a heavyweight UV-stabilized polypropylene top net and a lightweight photodegradable polypropylene bottom net, the SC150® ECB has increased durability, erosion control capabilities and longevity. It is suitable for steeper slopes, medium-flow channels and other areas where it may take vegetation up to 24 months to grow in.

EroNet™ S150® Short-Term Photodegradable Double-Net Straw Blanket

The S150 ECB is made with a 100% straw fiber matrix stitched between lightweight photodegradable polypropylene top and bottom nets. The S150 ECB's double-net construction has greater structural integrity than single net blankets for use on steeper slopes and in channels with moderate water flow. It provides erosion protection and mulching for up to 12 months.

EroNet™ DS150™ Ultra Short-Term Photodegradable Double-Net Straw Blanket

The DS150™ ECB is suitable for high maintenance areas where close mowing will occur soon after installation. Special additives in the thread and top and bottom net ensure it degrades in adequate sunlight within 60 days.

EroNet™ S75® Short-Term Photodegradable Single-Net Straw Blanket

The S75® ECB protects and mulches moderate slopes and low-flow channels in low maintenance areas for up to 12 months. It is constructed of 100% straw fiber stitched with degradable thread to a lightweight photodegradable polypropylene top net.

EroNet™ DS75™ Ultra Short-Term Photodegradable Single-Net Straw Blanket

Designed for high maintenance areas where close mowing will occur soon after installation, the DS75™ ECB degrades within 45 days because of special additives in the thread and top net that facilitate rapid breakdown in adequate sunlight.

Every site has its own unique characteristics and challenges. EroNet Erosion Control Blankets are available in varying longevities to suit a variety of scenarios and conditions.

With our Erosion Control Materials Design Software (ECMDS), you can select either short-term, extended-term or long-term EroNet blankets based on your specific design needs.

Temporary RollMax™ Solutions

BIONET® EROSION CONTROL BLANKETS

BioNet® 100% biodegradable ECBs provide effective and all-natural erosion control and vegetation establishment in an environmentally and wildlife friendly manner. All products in the line are made of organic, biodegradable materials perfect for bioengineering applications, environmentally sensitive sites, shaded areas, stream banks and shorelines. Other advantages are:

- Little to no risk of wildlife entrapment
- Easy to sprig or plant through
- High durability, fiber retention and mechanical stability with Leno weave technology
- Increased water absorption with jute netting vs. polypropylene netting
- Improved blanket conformance and adherence to soil vs. polypropylene netting
- Enhanced erosion protection and mulching capabilities vs. polypropylene netting
- Durable, flexible and 100% biodegradable
- Lightweight jute netting requires no direct sunlight exposure to initiate degradation

BioNet® C125BN™ Long-Term Biodegradable Double-Net Coconut Blanket

A dense layer of coconut fiber stitched between jute nettings allows the C125BN™ ECB to provide more effective erosion protection and mulch than open weave coir nettings. This product performs in critical applications for up to 24 months.

BioNet® SC150BN™ Extended-Term Biodegradable Double-Net Straw/Coconut Blanket

The SC150BN™ ECB features a layer of 70% straw and 30% coconut fiber stitched between biodegradable jute top and bottom nettings. It provides erosion protection and mulching for up to 18 months in applications requiring extra strength and erosion control properties.

BioNet® S150BN™ Short-Term Biodegradable Double-Net Straw Blanket

The S150BN™ ECB is used for applications requiring greater durability and performance than a single-net biodegradable ECB can provide. Made with a 100% straw fiber matrix stitched between biodegradable jute top and bottom nettings, it offers up to 12 months of erosion protection and mulching action.

BioNet® S75BN™ Short-Term Biodegradable Single-Net Straw Blanket

Consisting of a 100% straw fiber matrix stitched to a biodegradable jute top nettings, the S75BN™ ECB provides better erosion protection and mulching action than conventional open weave jute nettings alone. The S75BN ECB provides up to 12 months of erosion control and vegetation growth support.

Design and Installation Tools

SHIFT, CONTROL, ENTER

Professional guidance on RECP selection, design and project planning is at your fingertips with Tensar's proprietary Erosion Control Materials Design Software (ECMDS®). This web-based program incorporates design methodologies from the Federal Highway Administration and United States Department of Agriculture to analyze your specific site conditions, and make quantified recommendations based on data from controlled laboratory and field research. ECMDS is a must-have if you face tough erosion and sediment control regulations. Best of all, it's free of charge, compliments of Tensar. To learn more and access the software directly, go to **www.ECMDS.com**.

INSTRUCTIONS INCLUDED

Proper anchoring patterns and rates must be used to achieve optimal results in RECP installation. View our installation guides for stapling patterns. Site specific staple pattern recommendations based on soil type and severity of application may be acquired through our ECMDS.

HOLD ON TIGHT

When under the pressure of severe conditions, even the best erosion control products can't function to their full potential without proper installation and anchoring. Tensar supplies a wide variety of fastener options for nearly every application and soil type.

For use in cohesive soils, wire staples are a cost-effective means to fasten RECPs. Available in 6 in., 8 in., 10 in. and 12 in. lengths, our U-shaped staples can reach to various depths to ensure adequate pull-out resistance. For installation using our handy Pin Pounder installation tool, 6 in. V-top staples or 6 in. circle top pins are available.

Our biodegradable BioStakes® are available in 4 in. and 6 in. lengths and provide an environmentally friendly alternative to metal staples. For an even more durable, deeper reaching yet all-natural anchoring option, our wood EcoStakes® are available in 6 in., 12 in., 18 in. and 24 in. lengths.

For severe applications needing the ultimate, long-lasting hold, try our 12 and 18 in. rebar staples, our 12 in. plastic ShoreMax® stakes, or our complete line of percussion earth anchors. The Tensar earth anchors reach deep into the soil strata to offer enhanced anchoring in the worst conditions. Our variety of earth anchors are designed for durability and holding power under extreme hydraulic stresses and adverse soil conditions *(Table 1)*.

For more information on the RollMax Systems or other systems within the Tensar Erosion Control Solutions, call **800-TENSAR-1** or visit **www.tensarcorp.com**.

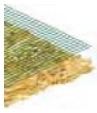
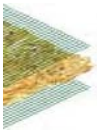
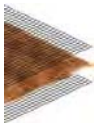
Earth Anchor Options

					EA 400		EA 680	
	Tendon Type (3/32 in. x 36 in.)	**Assembly Description**	**Fast Install**	**Economic Anchor**	**Stainless**	**Galvanized**	**Stainless**	**Galvanized**
End Piece Options with a PVC Face Plate	**Copper Stop Sleeve** with Stainless Steel Washer	Manually crimped to the stainless steel cable to secure the face plate.		X	X		X	
	Grip End Piece with Stainless Steel Washer	Three-dimensional, self-securing metal end piece that does not require manual crimping for tendon tensioning.	X	X	X	X	X	X
	Wedge Grip Piece	Self-securing end piece that installs flush to the face plate. Does not require manual crimping for tendon tensioning.	X		X	X	X	X
	Aluminum Stop Sleeve with Stainless Steel Washer	Manually crimped to the galvanized cable to secure the face plate.		X		X		X

TABLE 1

The complete line of RollMax™ products offers a variety of options for both short-term and permanent erosion control needs. Reference the RollMax Products Chart below to find the right solution for your next project.

RollMax Product Selection Chart

	TEMPORARY						
	ERONET						BIONET
							
	DS75	**DS150**	**S75**	**S150**	**SC150**	**C125**	**S75BN**
Longevity	45 days	60 days	12 mo.	12 mo.	24 mo.	36 mo.	12 mo.
Applications	Low Flow Channels 4:1-3:1 Slopes	Moderate Flow Channels 3:1-2:1 Slopes	Low Flow Channels 4:1-3:1 Slopes	Moderate Flow Channels 3:1-2:1 Slopes	Medium Flow Channels 2:1-1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	Low Flow Channels 4:1-3:1 Slopes
Design Permissible Shear Stress lbs/ft² (Pa)	Unvegetated 1.55 (74)	Unvegetated 1.75 (84)	Unvegetated 1.55 (74)	Unvegetated 1.75 (84)	Unvegetated 2.00 (96)	Unvegetated 2.25 (108)	Unvegetated 1.60 (76)
Design Permissible Velocity ft/s (m/s)	Unvegetated 5.00 (1.52)	Unvegetated 6.00 (1.52)	Unvegetated 5.00 (1.2)	Unvegetated 6.00 (1.83)	Unvegetated 8.00 (2.44)	Unvegetated 10.00 (3.05)	Unvegetated 5.00 (1.52)
Top Net	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft² (4.53 kg/100 m²) approx wt
Center Net	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fiber Matrix	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw/coconut matrix 70% Straw 0.35 lbs/yd² (0.19 kg/m²) 30% Coconut 0.15 lbs/yd² (0.08 kg/m²)	Coconut fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)
Bottom Net	N/A	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	N/A	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	N/A
Thread	Accelerated degradable	Accelerated degradable	Degradable	Degradable	Degradable	UV-stabilized polypropylene	Biodegradable

	TEMPORARY			PERMANENT			
	BIONET			ERONET	VMAX		
	S150BN	**SC150BN**	**C125BN**	**P300**	**SC250**	**C350**	**P550**
Longevity	12 mo.	18 mo.	24 mo.	Permanent	Permanent	Permanent	Permanent
Applications	Moderate Flow Channels 3:1-2:1 Slopes	Medium Flow Channels 2:1-1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	High-Flow Channels 1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	High-Flow Channels 1:1 and Greater Slopes	Extreme High-Flow Channels 1:1 and Greater Slopes
Design Permissible Shear Stress lbs/ft^2 (Pa)	Unvegetated 1.85 (88)	Unvegetated 2.10 (100)	Unvegetated 2.35 (112)	Unvegetated 3.0 (144) Vegetated 8.0 (383)	Unvegetated 3.0 (144) Vegetated 10.0 (480)	Unvegetated 3.2 (153) Vegetated 12.0 (576)	Unvegetated 4.0 (191) Vegetated 14.0 (672)
Design Permissible Velocity ft/s (m/s)	Unvegetated 6.00 (1.83)	Unvegetated 8.00 (2.44)	Unvegetated 10.00 (3.05)	Unvegetated 9.00 (2.7) Vegetated 16.0 (4.9)	Unvegetated 9.5 (2.9) Vegetated 15.0 (4.6)	Unvegetated 10.5 (3.2) Vegetated 20.0 (6.0)	Unvegetated 12.5 (3.8) Vegetated 25.0 (7.6)
Top Net	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Heavyweight polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Extra heavyweight polypropylene 8.0 lbs/1000 ft^2 (3.91 kg/100 m^2) approx wt	Ultra heavyweight polypropylene 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2) approx wt
Center Net	N/A	N/A	N/A	N/A	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)
Fiber Matrix	Straw fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	Straw/coconut matrix 70% Straw 0.35 lbs/yd^2 (0.19 kg/m^2) 30% Coconut 0.15 lbs/yd^2 (0.08 kg/m^2)	Coconut fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	UV-stabilized polypropylene fiber 0.70 lbs/yd^2 (0.38 kg/m^2)	Straw/coconut matrix 70% Straw 0.35 lbs/yd^2 (0.19 kg/m^2) 30% Coconut 0.15 lbs/yd^2 (0.08 kg/m^2)	Coconut fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	UV-stabilized polypropylene fiber 0.50 lbs/yd^2 (0.27 kg/m^2)
Bottom Net	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 3.0 lbs/1000 ft^2 (1.47 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Extra heavyweight polypropylene 8.0 lbs/1000 ft^2 (3.91 kg/100 m^2) approx wt	Ultra heavyweight polypropylene 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2) approx wt
Thread	Biodegradable	Biodegradable	Biodegradable	UV-stabilized polypropylene	UV-stabilized polypropylene	UV-stabilized polypropylene fiber	UV-stabilized polypropylene

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ DS75™ Erosion Control Blanket

DESCRIPTION

The ultra short-term single net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 45 days. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a polypropylene netting having an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographical location and elevation. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The DS75 shall meet Type 1.C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	100% Straw Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Top side only, lightweight photodegradable with photo accelerators	1.5 lb/1000 sq ft (0.73 g/sm)
Thread	Degradable	

Standard Roll Sizes			
Width	6.67 (2.03 m)	8.0 ft (2.4 m)	16 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	40 lbs (18.14 kg)	50 lbs (22.68 kg)	96 lbs (43.54 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.5 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.45 in. (11.43 mm)
Resiliency	ECTC Guidelines	78.8%
Water Absorbency	ASTM D1117	375%
Mass/Unit Area	ASTM 6475	8.57 oz/sy (291 g/sm)
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.31 oz-in
Light Penetration	ASTM D6567	10%
Tensile Strength - MD	ASTM D6818	105.6 lbs/ft (1.57 kN/m)
Elongation - MD	ASTM D6818	34%
Tensile Strength - TD	ASTM D6818	42.0 lbs/ft (0.62 kN/m)
Elongation - TD	ASTM D6818	25.2%
Biomass Improvement	ASTM D7322	286%

Design Permissible Shear Stress	
Unvegetated Shear Stress	1.55 psf (74 Pa)
Unvegetated Velocity	5.00 fps (1.52 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.029	N/A	N/A
20-50 ft	0.11	N/A	N/A
≥ 50 ft (15.2 m)	0.19	N/A	N/A

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.055
0.50 – 2.0 ft	0.055-0.021
≥ 2.0 ft (0.60 m)	0.021

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Specification Sheet – EroNet™ C125® Erosion Control Blanket

DESCRIPTION

The long-term double net erosion control blanket shall be a machine-produced mat of 100% coconut fiber with a functional longevity of up to 36 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in (1.59 x 1.59 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The C125 shall meet Type 4 specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	100% Coconut Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Heavyweight photodegradable with UV additives	3 lbs/1000 sq ft (1.47 g/sm)
Thread	Black polypropylene	

Standard Roll Sizes		
Width	6.67 (2.03 m)	8 ft (2.44 m)
Length	108 ft (32.92 m)	112 ft (35.14 m)
Weight ± 10%	44 lbs (19.95 kg)	56.25 (25.5 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.22 in. (5.59 mm)
Resiliency	ECTC Guidelines	82%
Water Absorbency	ASTM D1117	167%
Mass/Unit Area	ASTM 6475	7.73 oz/sy (262.8 g/sm)
Swell	ECTC Guidelines	13%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	0.75 oz-in
Light Penetration	ASTM D6567	16.6%
Tensile Strength - MD	ASTM D6818	472.8 lbs/ft (7.01 kN/m)
Elongation - MD	ASTM D6818	25.6%
Tensile Strength - TD	ASTM D6818	225.6 lbs/ft (3.35 kN/m)
Elongation - TD	ASTM D6818	33.9%
Biomass Improvement	ASTM 7322	257%

Design Permissible Shear Stress	
Unvegetated Shear Stress	2.25 psf (108 Pa)
Unvegetated Velocity	10.0 fps (3.05 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.029	0.082
20-50 ft	0.036	0.060	0.096
≥ 50 ft (15.2 m)	0.070	0.090	0.110

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.022
0.50 – 2.0 ft	0.022-0.014
≥ 2.0 ft (0.60 m)	0.014

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Specification Sheet – VMax® C350® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between super heavy duty UV-stabilized nettings with 0.50 x 0.50 in. (1.27 x 1.27 cm) openings, an ultra heavy duty UV-stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 in. (1.27 x 1.27 cm) openings, and covered by a super heavy duty UV-stabilized nettings with 0.50 x 0.50 in. (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 in. (3.81 cm) centers with UV-stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The C350 shall meet Type 5A, B and C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) *FP-03 Section 713.18*.

Material Content		
Matrix	100% Coconut Fiber	0.5 lb/sy (0.27 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	8 lb/1000 sf (3.91 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	37 lbs (16.8 kg)
Thread	40 sy (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.73 in. (18.54 mm)
Resiliency	ASTM D6524	90%
Density	ASTM D792	0.917 g/cm^3
Mass/Unit Area	ASTM D6566	18.36 oz/sy (624 g/sm)
UV Stability	ASTM D4355/ 1000 HR	86%
Porosity	ECTC Guidelines	99%
Stiffness	ASTM D1388	0.24 in.-lb (275990 mg-cm)
Light Penetration	ASTM D6567	7.2%
Tensile Strength – MD	ASTM D6818	585.8 lbs/ft (8.70 kN/m)
Elongation – MD	ASTM D6818	45.3%
Tensile Strength – TD	ASTM D6818	687.6 lbs/ft (10.20 kN/m)
Elongation – TD	ASTM D6818	19.5%
Biomass Improvement	ASTM D7322	380%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1 Unvegetated	3.2 psf (153 Pa)	3.0 psf (144 Pa)
Phase 2 Partially Veg.	10.0 psf (480 Pa)	10.0 psf (480 Pa)
Phase 3 Fully Veg.	12.0 psf (576 Pa)	10.0 psf (480 Pa)
Unvegetated Velocity	10.5 fps (3.2 m/s)	
Vegetated Velocity	20 fps (6.0 m/s)	

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.0005	0.015	0.043
20-50 ft	0.018	0.031	0.050
≥ 50 ft (15.2 m)	0.035	0.047	0.057

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.041
0.50 – 2.0 ft	0.040-0.013
≥ 2.0 ft (0.60 m)	0.012

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Specification Sheet – EroNet™ SC150® Erosion Control Blanket

DESCRIPTION

The extended-term double net erosion control blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 24 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in (1.59 x 1.59 cm) mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The SC150 shall meet Type 3.B specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	70% Straw Fiber 30% Coconut Fiber	0.35 lbs/sq yd (0.19 kg/sm) 0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top: Heavyweight photodegradable with UV additives	3 lbs/1000 sq ft (1.47 kg/100 sm)
	Bottom: lighweight photodegradable	1.5 lb/1000 sq ft (0.73 kg/100 sm)
Thread	Degradable	

Standard Roll Sizes			
Width	6.67 ft (2.03 m)	8 ft (2.4 m)	16.0 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	44 lbs (19.95 kg)	55 lbs (24.95 kg)	105.6 lbs (47.9 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.6 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.35 in. (8.89 mm)
Resiliency	ECTC Guidelines	75%
Water Absorbency	ASTM D1117	342%
Mass/Unit Area	ASTM D6475	7.87 oz/sy (267.6 g/sm)
Swell	ECTC Guidelines	30%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	1.11 oz-in
Light Penetration	ASTM D6567	6.2%
Tensile Strength - MD	ASTM D6818	362.4 lbs/ft (5.37 kN/m)
Elongation - MD	ASTM D6818	29.4%
Tensile Strength - TD	ASTM D6818	136.8 lbs/ft (2.03 kN/m)
Elongation - TD	ASTM D6818	27.6%
Biomass Improvement	ASTM D7322	481%

Design Permissible Shear Stress	
Unvegetated Shear Stress	2.00 psf (96 Pa)
Unvegetated Velocity	8.0 fps (2.44 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.048	0.100
20-50 ft	0.051	0.079	0.145
≥ 50 ft (15.2 m)	0.10	0.110	0.190

NTPEP Large-Scale Slope
ASTM D6459 - C-factor = 0.031

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.050
0.50 – 2.0 ft	0.050-0.018
≥ 2.0 ft (0.60 m)	0.018

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Specification Sheet – VMax® SC250® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 70% straw and 30% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The SC250 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	70% Straw Fiber	0.35 lb/sq yd (0.19 kg/sm)
	30% Coconut Fiber	0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	5 lb/1000 sq ft (2.44 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	34 lbs (15.42 kg)
Area	40 sq yd (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.62 in. (15.75 mm)
Resiliency	ASTM 6524	95.2%
Density	ASTM D792	0.891 g/cm^3
Mass/Unit Area	ASTM 6566	16.13 oz/sy (548 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	99%
Stiffness	ASTM D1388	222.65 oz-in.
Light Penetration	ASTM D6567	4.1%
Tensile Strength – MD	ASTM D6818	709 lbs/ft (10.51 kN/m)
Elongation – MD	ASTM D6818	23.9%
Tensile Strength – TD	ASTM D6818	712 lbs/ft (10.56 kN/m)
Elongation – TD	ASTM D6818	36.9%
Biomass Improvement	ASTM D7322	441%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1: Unvegetated	3.0 psf (144 Pa)	2.5 psf (120 Pa)
Phase 2: Partially Veg.	8.0 psf (383 Pa)	8.0 psf (383 Pa)
Phase 3: Fully Veg.	10.0 psf (480 Pa)	8.0 psf (383 Pa)
Unvegetated Velocity	9.5 fps (2.9 m/s)	
Vegetated Velocity	15 fps (4.6 m/s)	

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.0010	0.0209	0.0507
20-50 ft	0.0081	0.0266	0.0574
≥ 50 ft (15.2 m)	0.0455	0.0555	0.081

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.040
0.50 – 2.0 ft	0.040-0.012
≥ 2.0 ft (0.60 m)	0.011

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Specification Sheet – VMax® P550® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% UV stable polypropylene fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The P550 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	100% UV stable polypropylene fiber	0.5 lb/sy (0.27 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	52 lbs (23.59 kg)
Area	40 sy (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.72 in. (18.29 mm)
Resiliency	ASTM 6524	95%
Density	ASTM D792	0.892 g/cm^3
Mass/Unit Area	ASTM 6566	21.25 oz/sy (723 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	96%
Stiffness	ASTM D1388	366.3 oz-in.
Light Penetration	ASTM D6567	16.5%
Tensile Strength – MD	ASTM D6818	1421 lbs/ft (21.07 kN/m)
Elongation – MD	ASTM D6818	40.5%
Tensile Strength – TD	ASTM D6818	1191.6 lbs/ft (17.67 kN/m)
Elongation – TD	ASTM D6818	28.8%
Biomass Improvement	ASTM D7322	378%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1: Unvegetated	4.0 psf (191 Pa)	3.25 psf (156 Pa)
Phase 2: Partially Veg.	12.0 psf (576 Pa)	12.0 psf (576 Pa)
Phase 3: Fully Veg.	14.0 psf (672 Pa)	12.0 psf (576 Pa)
Unvegetated Velocity	12.5 fps (3.8 m/s)	
Vegetated Velocity	25 fps (7.6 m/s)	

NTPEP ASTM D6460 Large Scale Channel	
Vegetated Shear Stress	>13.2 psf (632 Pa)
Vegetated Velocity	>24.5 fps (7.47 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.0005	0.015	0.043
20-50 ft	0.0173	0.031	0.050
≥ 50 ft (15.2 m)	0.035	0.047	0.057

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.041
0.50 – 2.0 ft	0.040-0.013
≥ 2.0 ft (0.60 m)	0.013

Tensar®

NORTH AMERICAN GREEN®

Tensar International Corporation
2500 Northwinds Parkway
Suite 500
Alpharetta, GA 30009
800-TENSAR-1
tensarcorp.com

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – VMax® W3000™ High-Performance Turf Reinforcement Mat

DESCRIPTION

The VMax® W3000™ high performance turf reinforcement mat (HPTRM) is a machine-produced mat of 100% UV-stabilized high denier poly yarns woven into permanent, high strength three-dimensional turf reinforcement matting. The mat consists of a woven bottom layer integrally interlaced into a woven corrugated middle layer, with poly tendons on the top side spanning the entire machine direction. The mat is designed to provide sufficient thickness, optimum open area and three-dimensionality for effective erosion control and vegetation reinforcement against high flow induced shear forces. The mat has high tensile strength providing excellent damage resistance and increased bearing capacity of vegetated soils subject to heavy loads from maintenance equipment and other vehicular traffic. The corrugated structure provides a highly frictional surface to prevent sod slippage when sod is installed over the mat. When used as surface protection without sod overlay, the corrugated structure encapsulates the seed and soil in place while promoting self-soil infilling of the system.

Material Content		
Bottom	100% UV stable poly fiber weave	Black/Green
Corrugated Middle	100% UV stable poly fiber weave	Black/Green
Top	100% UV stable Poly Tendons	Green

Standard Roll Sizes	
Width	10 ft (3.05 m)
Length	90 ft (27.4 m)
Weight ± 10%	90 lbs (41.0 kg)
Area	100 sy (83.6 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.40 in. (10.2 mm)
Resiliency	ASTM D6524	98%
Mass/Unit Area	ASTM 6566	14.7oz/sy (495 g/m2)
Tensile Strength - MD	ASTM D6818	3600 lbs/ft (52.6 kN/m)
Elongation - MD	ASTM D6818	35%*
Tensile Strength - TD	ASTM D6818	3800 lbs/ft (55.5 kN/m)
Elongation - TD	ASTM D6818	20%*
Light Penetration	ASTM D6567	12%
UV Stability	ASTM D4355	>80% @3000 hrs

** Measured on fabric prior to corrugation for true measurement of base fabric elongation*

Design Permissible Shear Stress*	
Vegetated Shear Stress	16 psf (766 Pa)
Vegetated Velocity	25 fps (7.6 m/s)

**Values extrapolated through ASTM D6460 testing*

ASTM D6460 Large Scale Channel	
Vegetated Shear Stress	>13.2 psf (632 Pa)
Vegetated Velocity	>24.5 fps (7.47 m/s)

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ATTACHMENT 4.4

MOUNTABLE BERM WORKSHEET-
WESTERN TERMINUS MLV

STANDARD E&S WORKSHEET # 11
Channel Design Data for Mountable Berms**

PROJECT NAME: Leidy South-Hensel Replacement Western Terminus Main Line Valve
Prepared by: FPV, 5/2020
LOCATION: Clinton County, Pennsylvania Checked by: KCC, 5/2020

CHANNEL OR CHANNEL SECTION		MB-1
TEMPORARY OR PERMANENT?	(T OR P)	P
DESIGN STORM	(2, 5, OR 10 YR)	10 yr
ACRES	(AC)	1.73
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	2.06
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.72
PROTECTIVE LINING[2]		Grass
n (MANNING'S COEFFICIENT)[2]		0.15
V_a (ALLOWABLE VELOCITY)	(FPS)	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.7
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	--
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	5.4
CHANNEL BOTTOM WIDTH	(FT)	--
CHANNEL SIDE SLOPES	(H:V)	2 and 2
D (TOTAL DEPTH)	(FT)	1.4
CHANNEL TOP WIDTH @ D	(FT)	5.6
d (CALCULATED FLOW DEPTH)	(FT)	0.9
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.60
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	--
d_{50} STONE SIZE	(IN)	N/A
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.620
R (HYDRAULIC RADIUS)		0.402
S (BED SLOPE)[3]	(FT/FT)	0.097
S_c (CRITICAL SLOPE)	(FT/FT)	0.496
$.7S_c$	(FT/FT)	0.347
$1.3S_c$	(FT/FT)	0.656
STABLE FLOW?	(Y/N)	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.2
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

** Mountable Berms are designed as V-channels with zero bottom width

ATTACHMENT 4.5
CULVERT SCHEDULE-
EASTERN TERMINUS MLV

Hensel Eastern Terminus Main Line Valve Culvert Schedule

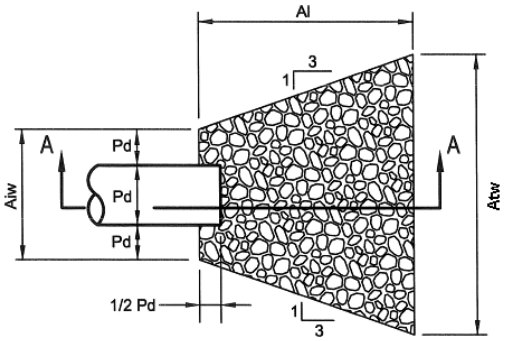
I.D.	Drainage Area [ac]	Req'd Flow [cfs]	Length (ft)	Slope [ft/ft]	No. of Pipes	Pipe Diameter [in]
CULVERT #1	0.14	0.67	37.00	0.048	1	12

* Culvert sizes were calculated using HydroCAD software based on SCS TR-20 Runoff calculation method

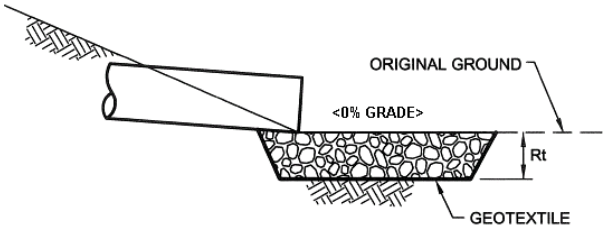
ATTACHMENT 4.6
RIPRAP APRON WORKSHEET-
EASTERN TERMINUS MLV

STANDARD E&S WORKSHEET # 20
Riprap Apron Outlet Protection

PROJECT NAME: Leidy South – Hensel Replacement
LOCATION: Hensel Replacement – Eastern Terminus Main Line Valve
PREPARED BY: FPV DATE: 05/12/2020
CHECKED BY: KCC DATE: 05/12/2020



PLAN VIEW

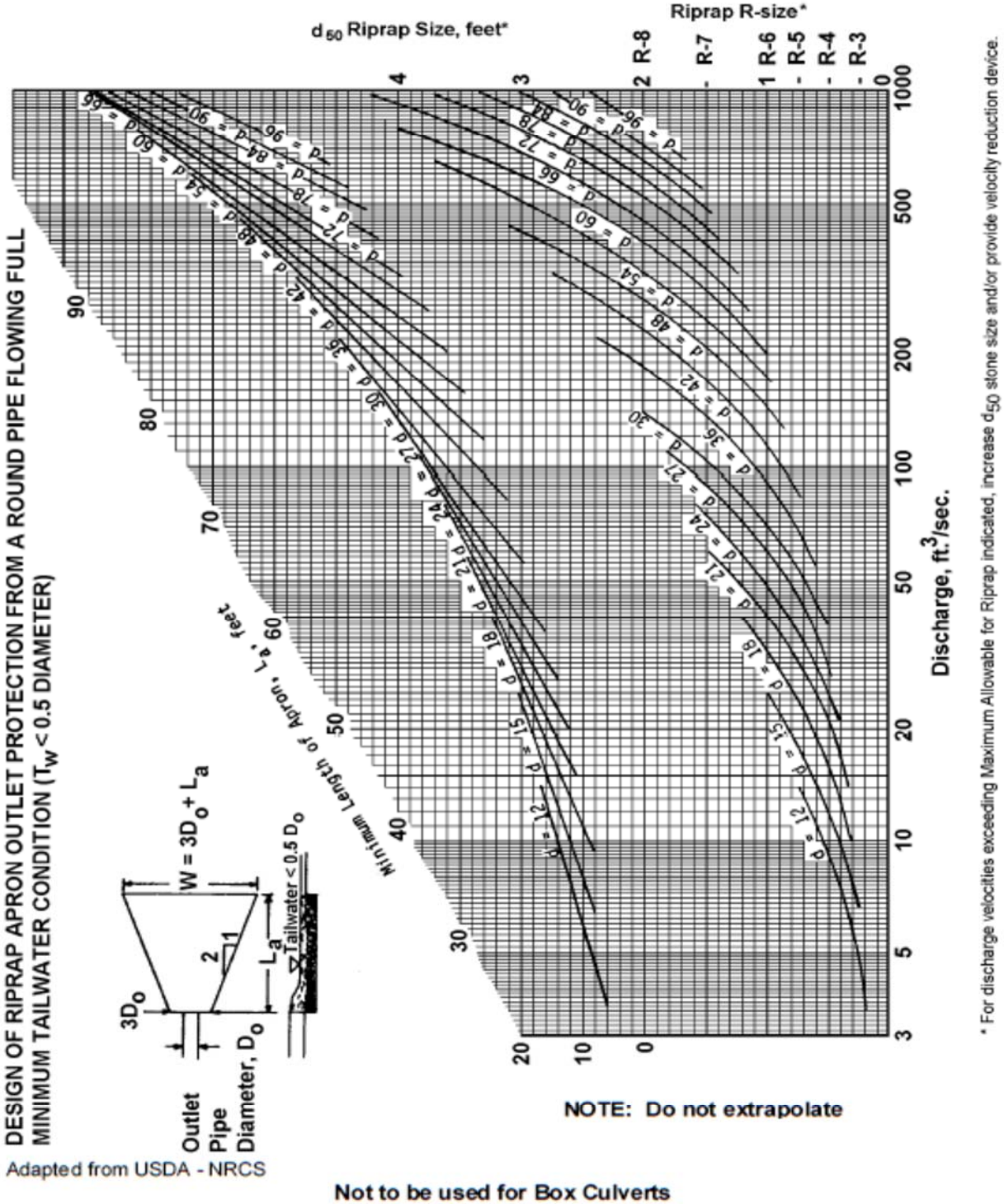


SECTION A - A

NO.	PIPE DIA. Do (in.)	TAIL WATER COND. (Max or Min)	MAN. "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
Culvert #1 Outlet	12	Min	0.012	0.048	0.67	0.85	R-3	9	6	3	9

***:The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning's equation to calculate velocity for pipe slopes ≥ 0.05 ft/ft.**

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



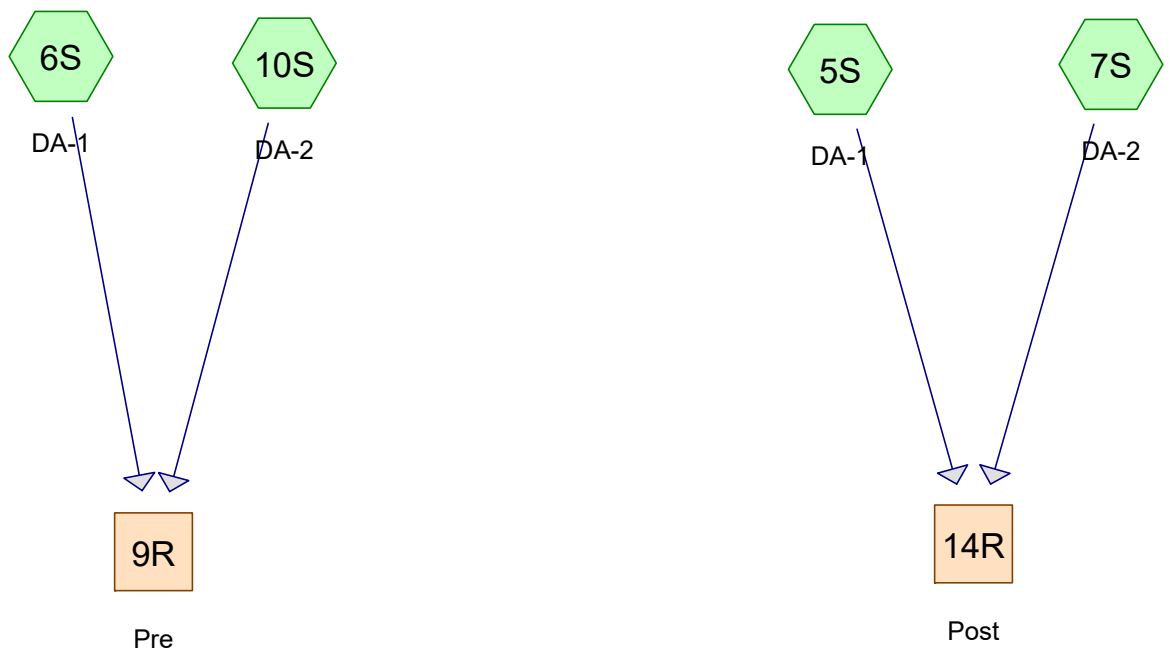
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

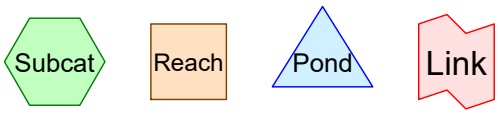
Adapted from USDA - NRCS

Not to be used for Box Culverts

ATTACHMENT 4.7

HYDROCAD REPORT-
EASTERN TERMINUS MLV





Routing Diagram for Hensel Eastern Terminus MLV_Pre&post
Prepared by Microsoft, Printed 9/20/2019
HydroCAD® 10.00-20 s/n 09710 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
36,285	89	Gravel roads, HSG C (5S, 7S)
171,278	58	Meadow, non-grazed, HSG B (5S, 6S, 7S, 10S)
129,635	60	Woods, Fair, HSG B (5S, 6S, 7S, 10S)
337,198	**62**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
300,912	HSG B	5S, 6S, 7S, 10S
36,285	HSG C	5S, 7S
0	HSG D	
0	Other	
337,198		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatc Number
0	0	36,285	0	0	36,285	Gravel roads	
0	171,278	0	0	0	171,278	Meadow, non-grazed	
0	129,635	0	0	0	129,635	Woods, Fair	
0	**300,912**	**36,285**	**0**	**0**	**337,198**	**TOTAL AREA**	

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>0.16"
Flow Length=861' Tc=20.5 min CN=66 Runoff=0.18 cfs 1,078 cf

Subcatchment 6S: DA-1 Runoff Area=1.350 ac 0.00% Impervious Runoff Depth>0.06"
Flow Length=591' Tc=24.8 min CN=59 Runoff=0.01 cfs 270 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>0.15"
Flow Length=471' Tc=17.4 min CN=65 Runoff=0.18 cfs 1,115 cf

Subcatchment 10S: DA-2 Runoff Area=2.488 ac 0.00% Impervious Runoff Depth>0.04"
Flow Length=1,021' Tc=29.7 min CN=58 Runoff=0.02 cfs 396 cf

Reach 9R: Pre Inflow=0.03 cfs 666 cf
Outflow=0.03 cfs 666 cf

Reach 14R: Post Inflow=0.36 cfs 2,193 cf
Outflow=0.36 cfs 2,193 cf

Total Runoff Area = 337,198 sf Runoff Volume = 2,859 cf Average Runoff Depth = 0.10"
100.00% Pervious = 337,198 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

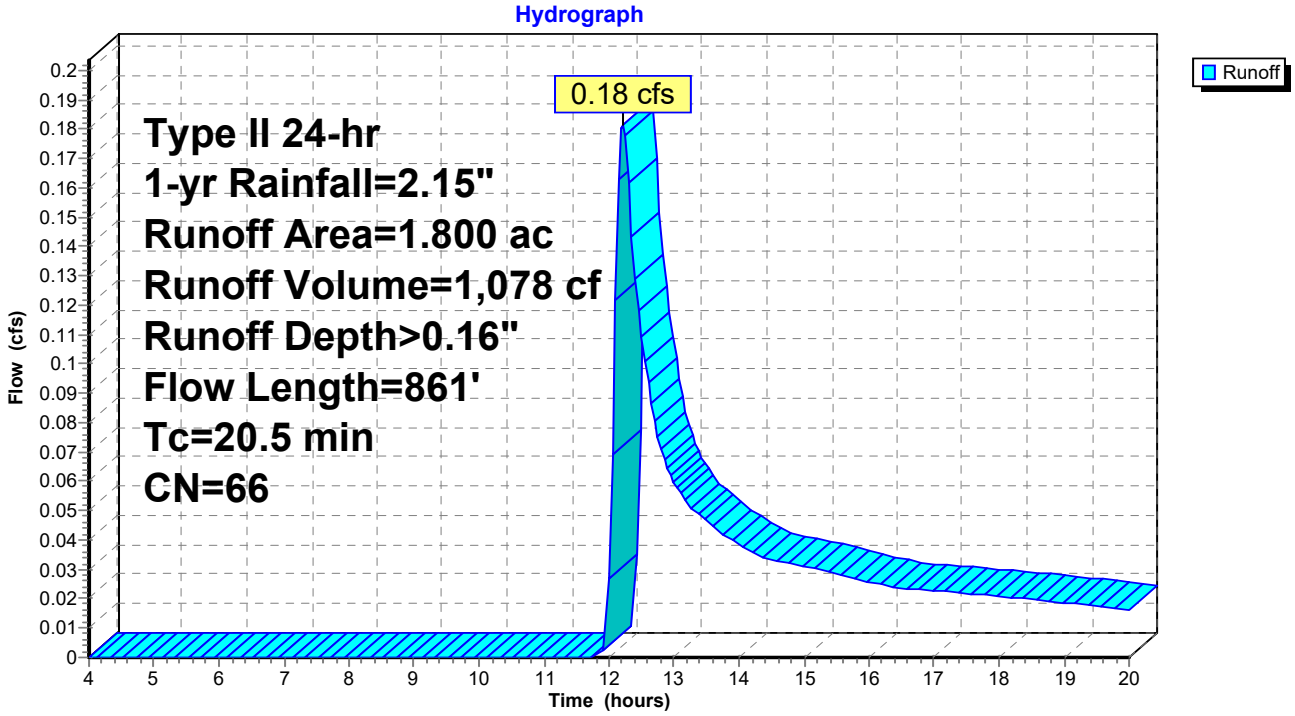
Runoff = 0.18 cfs @ 12.22 hrs, Volume= 1,078 cf, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.15"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.10	0.00	0.00	17.00	1.94	0.14	0.02
4.25	0.11	0.00	0.00	17.25	1.95	0.14	0.02
4.50	0.12	0.00	0.00	17.50	1.96	0.14	0.02
4.75	0.13	0.00	0.00	17.75	1.97	0.15	0.02
5.00	0.14	0.00	0.00	18.00	1.98	0.15	0.02
5.25	0.14	0.00	0.00	18.25	1.99	0.15	0.02
5.50	0.15	0.00	0.00	18.50	2.00	0.15	0.02
5.75	0.16	0.00	0.00	18.75	2.01	0.16	0.02
6.00	0.17	0.00	0.00	19.00	2.02	0.16	0.02
6.25	0.18	0.00	0.00	19.25	2.02	0.16	0.02
6.50	0.19	0.00	0.00	19.50	2.03	0.16	0.02
6.75	0.20	0.00	0.00	19.75	2.04	0.17	0.02
7.00	0.21	0.00	0.00	20.00	**2.05**	**0.17**	0.02
7.25	0.22	0.00	0.00				
7.50	0.23	0.00	0.00				
7.75	0.25	0.00	0.00				
8.00	0.26	0.00	0.00				
8.25	0.27	0.00	0.00				
8.50	0.28	0.00	0.00				
8.75	0.30	0.00	0.00				
9.00	0.32	0.00	0.00				
9.25	0.33	0.00	0.00				
9.50	0.35	0.00	0.00				
9.75	0.37	0.00	0.00				
10.00	0.39	0.00	0.00				
10.25	0.41	0.00	0.00				
10.50	0.44	0.00	0.00				
10.75	0.47	0.00	0.00				
11.00	0.51	0.00	0.00				
11.25	0.55	0.00	0.00				
11.50	0.61	0.00	0.00				
11.75	0.83	0.00	0.00				
12.00	1.43	0.03	**0.03**				
12.25	1.52	0.04	**0.18**				
12.50	1.58	0.05	0.11				
12.75	1.62	0.06	0.08				
13.00	1.66	0.07	0.06				
13.25	1.69	0.08	0.05				
13.50	1.72	0.08	0.05				
13.75	1.74	0.09	0.04				
14.00	1.76	0.09	0.04				
14.25	1.78	0.10	0.03				
14.50	1.80	0.10	0.03				
14.75	1.82	0.10	0.03				
15.00	1.84	0.11	0.03				
15.25	1.85	0.11	0.03				
15.50	1.87	0.12	0.03				
15.75	1.88	0.12	0.03				
16.00	1.89	0.12	0.03				
16.25	1.90	0.13	0.02				
16.50	1.92	0.13	0.02				
16.75	1.93	0.13	0.02				

Summary for Subcatchment 6S: DA-1

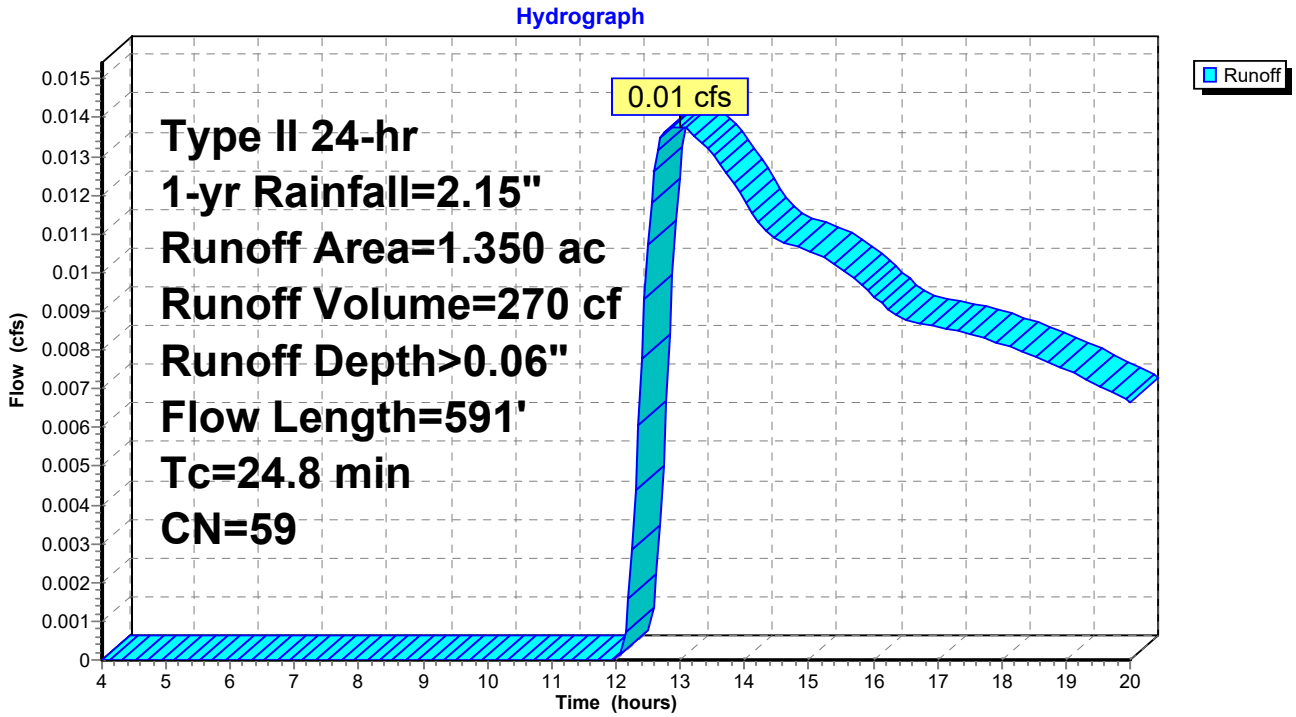
Runoff = 0.01 cfs @ 13.00 hrs, Volume= 270 cf, Depth> 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.15"

Area (ac)	CN	Description
0.992	60	Woods, Fair, HSG B
0.358	58	Meadow, non-grazed, HSG B
1.350	59	Weighted Average
1.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.1	100	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.9	143	0.1600	2.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.8	348	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	591	Total			

Subcatchment 6S: DA-1



Hydrograph for Subcatchment 6S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.10	0.00	0.00	17.00	1.94	0.04	0.01
4.25	0.11	0.00	0.00	17.25	1.95	0.04	0.01
4.50	0.12	0.00	0.00	17.50	1.96	0.04	0.01
4.75	0.13	0.00	0.00	17.75	1.97	0.04	0.01
5.00	0.14	0.00	0.00	18.00	1.98	0.05	0.01
5.25	0.14	0.00	0.00	18.25	1.99	0.05	0.01
5.50	0.15	0.00	0.00	18.50	2.00	0.05	0.01
5.75	0.16	0.00	0.00	18.75	2.01	0.05	0.01
6.00	0.17	0.00	0.00	19.00	2.02	0.05	0.01
6.25	0.18	0.00	0.00	19.25	2.02	0.05	0.01
6.50	0.19	0.00	0.00	19.50	2.03	0.05	0.01
6.75	0.20	0.00	0.00	19.75	2.04	0.06	0.01
7.00	0.21	0.00	0.00	20.00	**2.05**	**0.06**	0.01
7.25	0.22	0.00	0.00				
7.50	0.23	0.00	0.00				
7.75	0.25	0.00	0.00				
8.00	0.26	0.00	0.00				
8.25	0.27	0.00	0.00				
8.50	0.28	0.00	0.00				
8.75	0.30	0.00	0.00				
9.00	0.32	0.00	0.00				
9.25	0.33	0.00	0.00				
9.50	0.35	0.00	0.00				
9.75	0.37	0.00	0.00				
10.00	0.39	0.00	0.00				
10.25	0.41	0.00	0.00				
10.50	0.44	0.00	0.00				
10.75	0.47	0.00	0.00				
11.00	0.51	0.00	0.00				
11.25	0.55	0.00	0.00				
11.50	0.61	0.00	0.00				
11.75	0.83	0.00	0.00				
12.00	1.43	0.00	0.00				
12.25	1.52	0.00	0.00				
12.50	1.58	0.01	0.01				
12.75	1.62	0.01	0.01				
13.00	1.66	0.01	**0.01**				
13.25	1.69	0.01	0.01				
13.50	1.72	0.01	0.01				
13.75	1.74	0.02	0.01				
14.00	1.76	0.02	0.01				
14.25	1.78	0.02	0.01				
14.50	1.80	0.02	0.01				
14.75	1.82	0.02	0.01				
15.00	1.84	0.03	0.01				
15.25	1.85	0.03	0.01				
15.50	1.87	0.03	0.01				
15.75	1.88	0.03	0.01				
16.00	1.89	0.03	0.01				
16.25	1.90	0.04	0.01				
16.50	1.92	0.04	0.01				
16.75	1.93	0.04	0.01				

Summary for Subcatchment 7S: DA-2

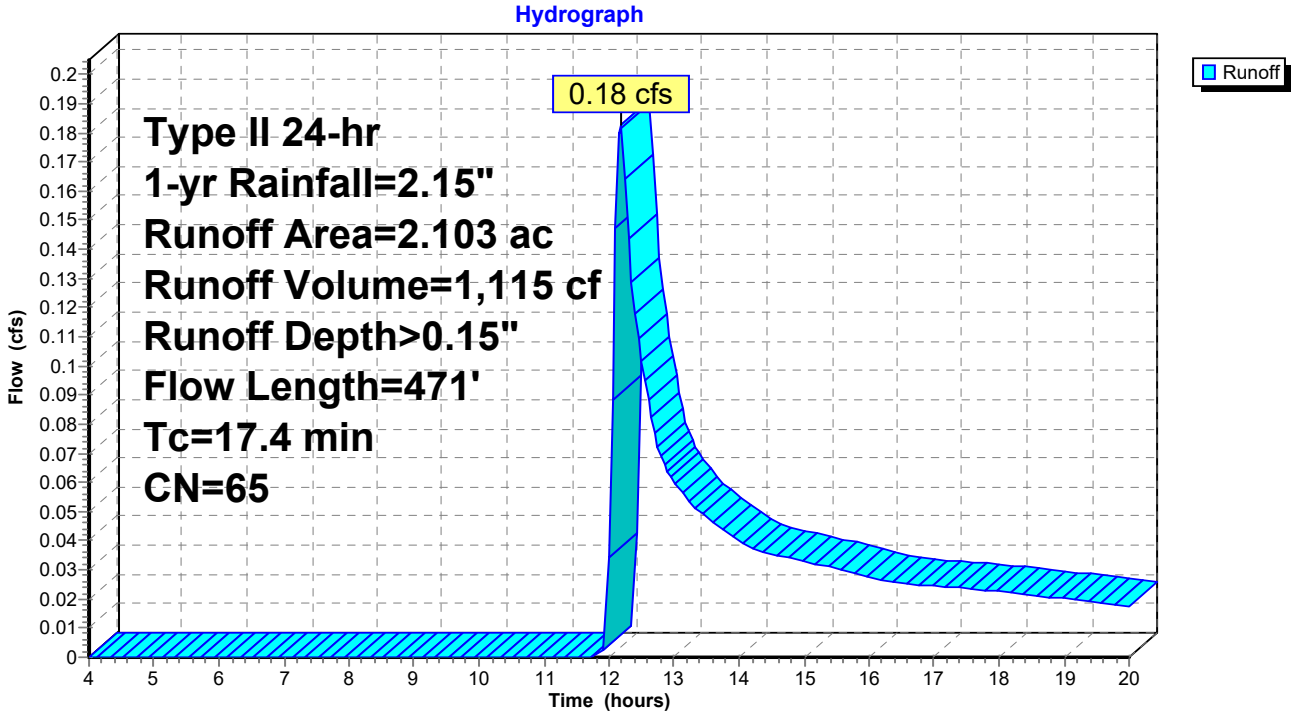
Runoff = 0.18 cfs @ 12.18 hrs, Volume= 1,115 cf, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.15"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.10	0.00	0.00	17.00	1.94	0.12	0.02
4.25	0.11	0.00	0.00	17.25	1.95	0.12	0.02
4.50	0.12	0.00	0.00	17.50	1.96	0.12	0.02
4.75	0.13	0.00	0.00	17.75	1.97	0.13	0.02
5.00	0.14	0.00	0.00	18.00	1.98	0.13	0.02
5.25	0.14	0.00	0.00	18.25	1.99	0.13	0.02
5.50	0.15	0.00	0.00	18.50	2.00	0.13	0.02
5.75	0.16	0.00	0.00	18.75	2.01	0.14	0.02
6.00	0.17	0.00	0.00	19.00	2.02	0.14	0.02
6.25	0.18	0.00	0.00	19.25	2.02	0.14	0.02
6.50	0.19	0.00	0.00	19.50	2.03	0.14	0.02
6.75	0.20	0.00	0.00	19.75	2.04	0.15	0.02
7.00	0.21	0.00	0.00	20.00	**2.05**	**0.15**	0.02
7.25	0.22	0.00	0.00				
7.50	0.23	0.00	0.00				
7.75	0.25	0.00	0.00				
8.00	0.26	0.00	0.00				
8.25	0.27	0.00	0.00				
8.50	0.28	0.00	0.00				
8.75	0.30	0.00	0.00				
9.00	0.32	0.00	0.00				
9.25	0.33	0.00	0.00				
9.50	0.35	0.00	0.00				
9.75	0.37	0.00	0.00				
10.00	0.39	0.00	0.00				
10.25	0.41	0.00	0.00				
10.50	0.44	0.00	0.00				
10.75	0.47	0.00	0.00				
11.00	0.51	0.00	0.00				
11.25	0.55	0.00	0.00				
11.50	0.61	0.00	0.00				
11.75	0.83	0.00	0.00				
12.00	1.43	0.02	**0.03**				
12.25	1.52	0.03	**0.16**				
12.50	1.58	0.04	0.10				
12.75	1.62	0.05	0.07				
13.00	1.66	0.06	0.06				
13.25	1.69	0.06	0.05				
13.50	1.72	0.07	0.05				
13.75	1.74	0.07	0.04				
14.00	1.76	0.08	0.04				
14.25	1.78	0.08	0.04				
14.50	1.80	0.09	0.04				
14.75	1.82	0.09	0.03				
15.00	1.84	0.09	0.03				
15.25	1.85	0.10	0.03				
15.50	1.87	0.10	0.03				
15.75	1.88	0.10	0.03				
16.00	1.89	0.11	0.03				
16.25	1.90	0.11	0.03				
16.50	1.92	0.11	0.03				
16.75	1.93	0.12	0.02				

Summary for Subcatchment 10S: DA-2

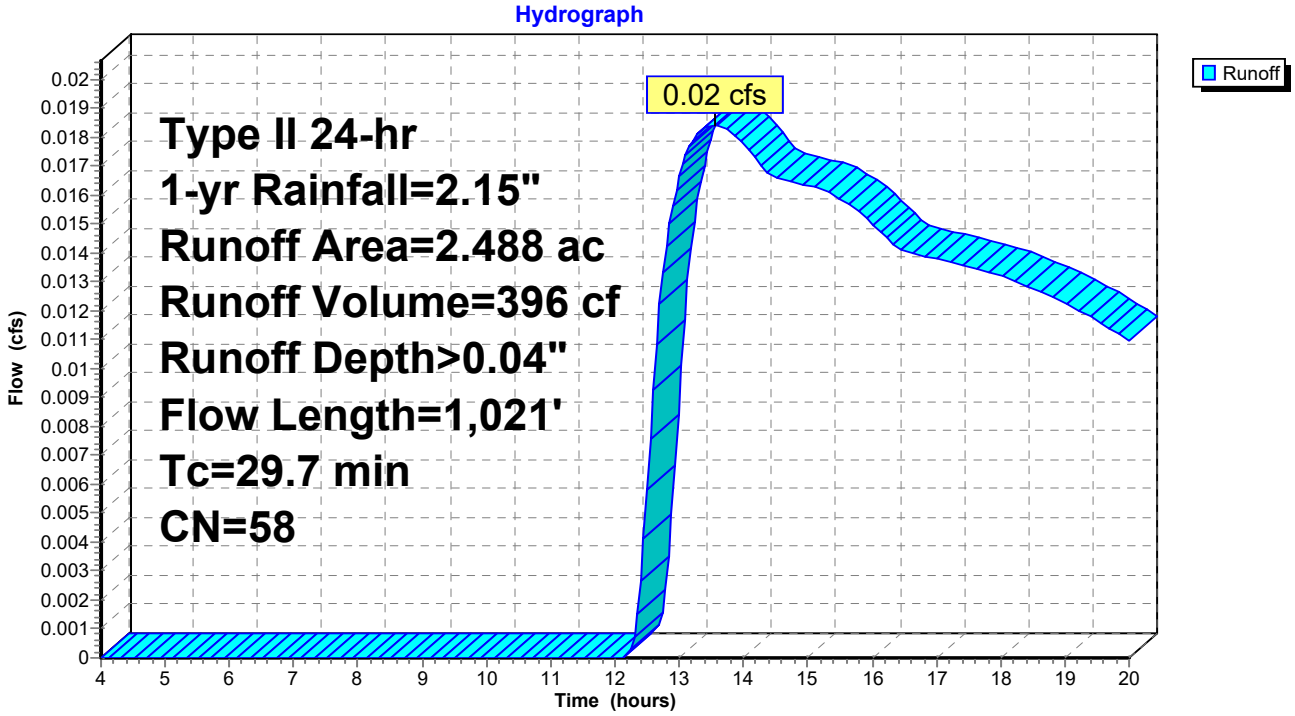
Runoff = 0.02 cfs @ 13.55 hrs, Volume= 396 cf, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.15"

Area (ac)	CN	Description
2.040	58	Meadow, non-grazed, HSG B
0.448	60	Woods, Fair, HSG B
2.488	58	Weighted Average
2.488		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.3	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
9.4	921	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.7	1,021	Total			

Subcatchment 10S: DA-2



Hydrograph for Subcatchment 10S: DA-2

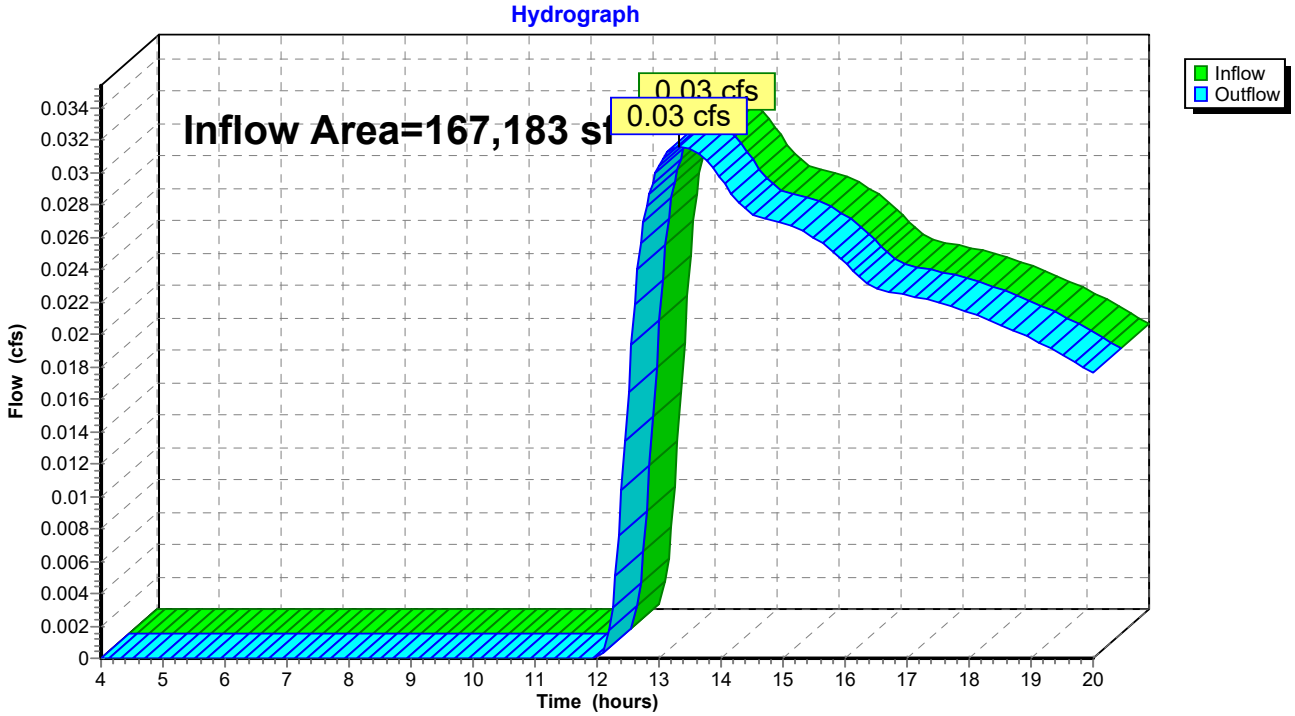
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.10	0.00	0.00	17.00	1.94	0.03	0.01
4.25	0.11	0.00	0.00	17.25	1.95	0.03	0.01
4.50	0.12	0.00	0.00	17.50	1.96	0.03	0.01
4.75	0.13	0.00	0.00	17.75	1.97	0.04	0.01
5.00	0.14	0.00	0.00	18.00	1.98	0.04	0.01
5.25	0.14	0.00	0.00	18.25	1.99	0.04	0.01
5.50	0.15	0.00	0.00	18.50	2.00	0.04	0.01
5.75	0.16	0.00	0.00	18.75	2.01	0.04	0.01
6.00	0.17	0.00	0.00	19.00	2.02	0.04	0.01
6.25	0.18	0.00	0.00	19.25	2.02	0.04	0.01
6.50	0.19	0.00	0.00	19.50	2.03	0.04	0.01
6.75	0.20	0.00	0.00	19.75	2.04	0.04	0.01
7.00	0.21	0.00	0.00	20.00	**2.05**	**0.05**	0.01
7.25	0.22	0.00	0.00				
7.50	0.23	0.00	0.00				
7.75	0.25	0.00	0.00				
8.00	0.26	0.00	0.00				
8.25	0.27	0.00	0.00				
8.50	0.28	0.00	0.00				
8.75	0.30	0.00	0.00				
9.00	0.32	0.00	0.00				
9.25	0.33	0.00	0.00				
9.50	0.35	0.00	0.00				
9.75	0.37	0.00	0.00				
10.00	0.39	0.00	0.00				
10.25	0.41	0.00	0.00				
10.50	0.44	0.00	0.00				
10.75	0.47	0.00	0.00				
11.00	0.51	0.00	0.00				
11.25	0.55	0.00	0.00				
11.50	0.61	0.00	0.00				
11.75	0.83	0.00	0.00				
12.00	1.43	0.00	0.00				
12.25	1.52	0.00	0.00				
12.50	1.58	0.00	0.01				
12.75	1.62	0.00	0.01				
13.00	1.66	0.01	0.02				
13.25	1.69	0.01	0.02				
13.50	1.72	0.01	**0.02**				
13.75	1.74	0.01	**0.02**				
14.00	1.76	0.01	0.02				
14.25	1.78	0.01	0.02				
14.50	1.80	0.02	0.02				
14.75	1.82	0.02	0.02				
15.00	1.84	0.02	0.02				
15.25	1.85	0.02	0.02				
15.50	1.87	0.02	0.02				
15.75	1.88	0.02	0.02				
16.00	1.89	0.03	0.02				
16.25	1.90	0.03	0.01				
16.50	1.92	0.03	0.01				
16.75	1.93	0.03	0.01				

Summary for Reach 9R: Pre

Inflow Area = 167,183 sf, 0.00% Impervious, Inflow Depth > 0.05" for 1-yr event
Inflow = 0.03 cfs @ 13.32 hrs, Volume= 666 cf
Outflow = 0.03 cfs @ 13.32 hrs, Volume= 666 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 9R: Pre



Hydrograph for Reach 9R: Pre

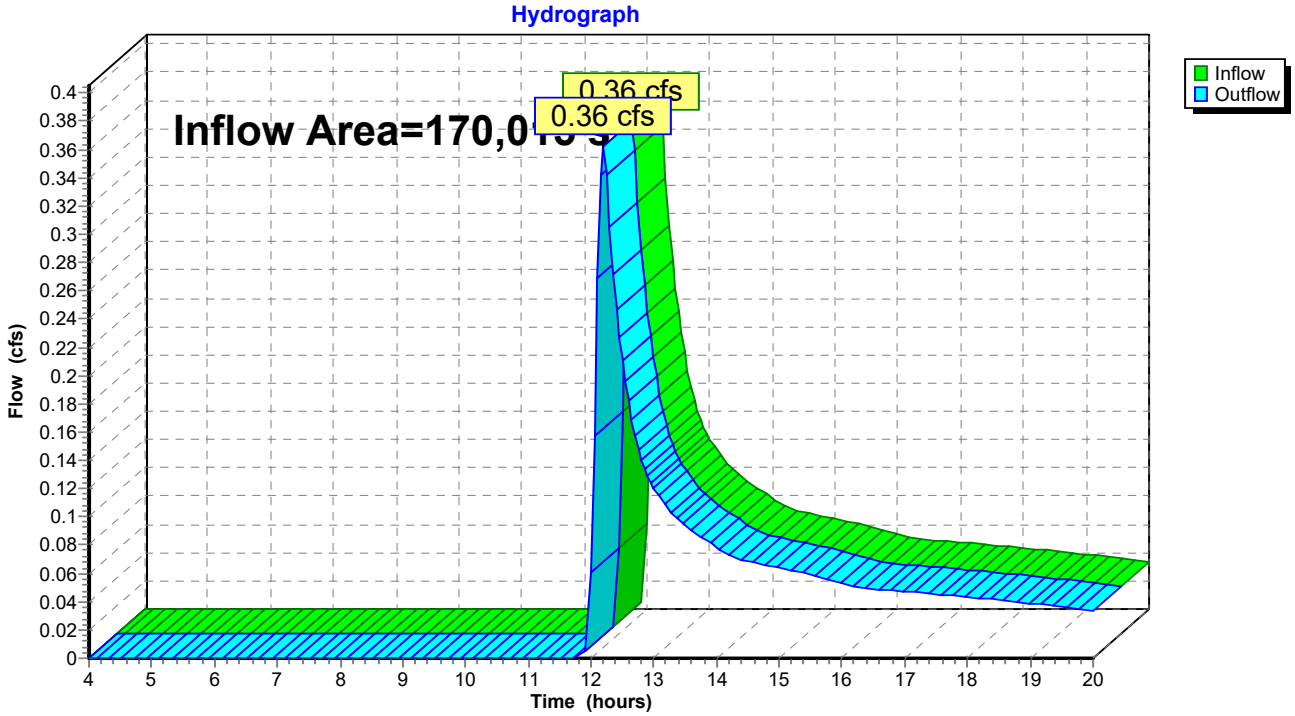
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.02		0.02
4.25	0.00		0.00	17.25	0.02		0.02
4.50	0.00		0.00	17.50	0.02		0.02
4.75	0.00		0.00	17.75	0.02		0.02
5.00	0.00		0.00	18.00	0.02		0.02
5.25	0.00		0.00	18.25	0.02		0.02
5.50	0.00		0.00	18.50	0.02		0.02
5.75	0.00		0.00	18.75	0.02		0.02
6.00	0.00		0.00	19.00	0.02		0.02
6.25	0.00		0.00	19.25	0.02		0.02
6.50	0.00		0.00	19.50	0.02		0.02
6.75	0.00		0.00	19.75	0.02		0.02
7.00	0.00		0.00	20.00	0.02		0.02
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.00		0.00				
12.00	0.00		0.00				
12.25	0.00		0.00				
12.50	0.02		0.02				
12.75	0.03		0.03				
13.00	0.03		0.03				
13.25	**0.03**		**0.03**				
13.50	**0.03**		**0.03**				
13.75	0.03		0.03				
14.00	0.03		0.03				
14.25	0.03		0.03				
14.50	0.03		0.03				
14.75	0.03		0.03				
15.00	0.03		0.03				
15.25	0.03		0.03				
15.50	0.03		0.03				
15.75	0.03		0.03				
16.00	0.02		0.02				
16.25	0.02		0.02				
16.50	0.02		0.02				
16.75	0.02		0.02				

Summary for Reach 14R: Post

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 0.15" for 1-yr event
Inflow = 0.36 cfs @ 12.20 hrs, Volume= 2,193 cf
Outflow = 0.36 cfs @ 12.20 hrs, Volume= 2,193 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post



Hydrograph for Reach 14R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.05		0.05
4.25	0.00		0.00	17.25	0.05		0.05
4.50	0.00		0.00	17.50	0.05		0.05
4.75	0.00		0.00	17.75	0.04		0.04
5.00	0.00		0.00	18.00	0.04		0.04
5.25	0.00		0.00	18.25	0.04		0.04
5.50	0.00		0.00	18.50	0.04		0.04
5.75	0.00		0.00	18.75	0.04		0.04
6.00	0.00		0.00	19.00	0.04		0.04
6.25	0.00		0.00	19.25	0.04		0.04
6.50	0.00		0.00	19.50	0.04		0.04
6.75	0.00		0.00	19.75	0.03		0.03
7.00	0.00		0.00	20.00	0.03		0.03
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.00		0.00				
12.00	**0.06**		**0.06**				
12.25	**0.34**		**0.34**				
12.50	0.21		0.21				
12.75	0.15		0.15				
13.00	0.12		0.12				
13.25	0.10		0.10				
13.50	0.09		0.09				
13.75	0.09		0.09				
14.00	0.08		0.08				
14.25	0.07		0.07				
14.50	0.07		0.07				
14.75	0.07		0.07				
15.00	0.06		0.06				
15.25	0.06		0.06				
15.50	0.06		0.06				
15.75	0.06		0.06				
16.00	0.05		0.05				
16.25	0.05		0.05				
16.50	0.05		0.05				
16.75	0.05		0.05				

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>0.31"
Flow Length=861' Tc=20.5 min CN=66 Runoff=0.46 cfs 1,994 cf

Subcatchment 6S: DA-1 Runoff Area=1.350 ac 0.00% Impervious Runoff Depth>0.14"
Flow Length=591' Tc=24.8 min CN=59 Runoff=0.07 cfs 680 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>0.28"
Flow Length=471' Tc=17.4 min CN=65 Runoff=0.52 cfs 2,123 cf

Subcatchment 10S: DA-2 Runoff Area=2.488 ac 0.00% Impervious Runoff Depth>0.12"
Flow Length=1,021' Tc=29.7 min CN=58 Runoff=0.09 cfs 1,081 cf

Reach 9R: Pre Inflow=0.16 cfs 1,761 cf
Outflow=0.16 cfs 1,761 cf

Reach 14R: Post Inflow=0.98 cfs 4,118 cf
Outflow=0.98 cfs 4,118 cf

Total Runoff Area = 337,198 sf Runoff Volume = 5,878 cf Average Runoff Depth = 0.21"
100.00% Pervious = 337,198 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

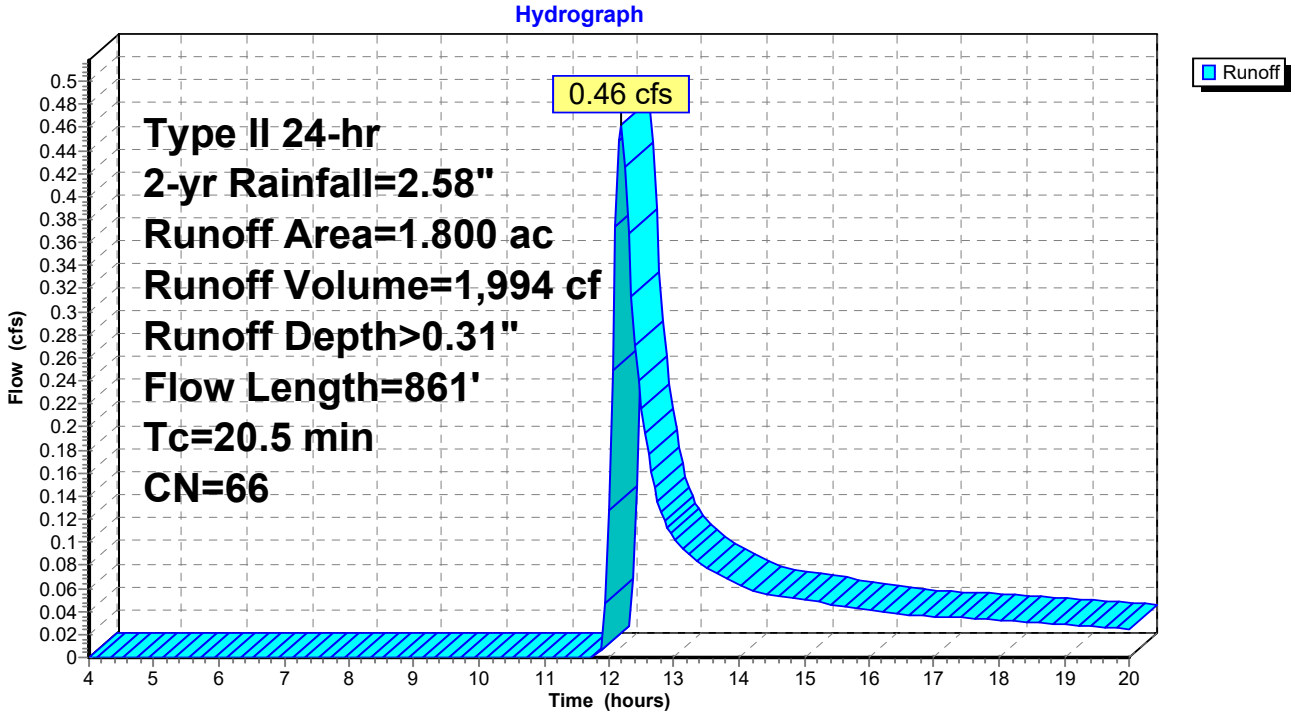
Runoff = 0.46 cfs @ 12.19 hrs, Volume= 1,994 cf, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.12	0.00	0.00	17.00	2.33	0.26	0.04
4.25	0.13	0.00	0.00	17.25	2.34	0.27	0.03
4.50	0.14	0.00	0.00	17.50	2.35	0.27	0.03
4.75	0.15	0.00	0.00	17.75	2.36	0.27	0.03
5.00	0.16	0.00	0.00	18.00	2.38	0.28	0.03
5.25	0.17	0.00	0.00	18.25	2.39	0.28	0.03
5.50	0.18	0.00	0.00	18.50	2.40	0.29	0.03
5.75	0.19	0.00	0.00	18.75	2.41	0.29	0.03
6.00	0.21	0.00	0.00	19.00	2.42	0.30	0.03
6.25	0.22	0.00	0.00	19.25	2.43	0.30	0.03
6.50	0.23	0.00	0.00	19.50	2.44	0.30	0.03
6.75	0.24	0.00	0.00	19.75	2.45	0.31	0.03
7.00	0.26	0.00	0.00	20.00	**2.46**	**0.31**	0.02
7.25	0.27	0.00	0.00				
7.50	0.28	0.00	0.00				
7.75	0.30	0.00	0.00				
8.00	0.31	0.00	0.00				
8.25	0.32	0.00	0.00				
8.50	0.34	0.00	0.00				
8.75	0.36	0.00	0.00				
9.00	0.38	0.00	0.00				
9.25	0.40	0.00	0.00				
9.50	0.42	0.00	0.00				
9.75	0.44	0.00	0.00				
10.00	0.47	0.00	0.00				
10.25	0.49	0.00	0.00				
10.50	0.53	0.00	0.00				
10.75	0.56	0.00	0.00				
11.00	0.61	0.00	0.00				
11.25	0.66	0.00	0.00				
11.50	0.73	0.00	0.00				
11.75	1.00	0.00	0.00				
12.00	1.71	0.08	**0.13**				
12.25	1.82	0.11	**0.43**				
12.50	1.90	0.12	0.22				
12.75	1.95	0.14	0.14				
13.00	1.99	0.15	0.10				
13.25	2.03	0.16	0.09				
13.50	2.06	0.17	0.08				
13.75	2.09	0.18	0.07				
14.00	2.12	0.19	0.06				
14.25	2.14	0.20	0.06				
14.50	2.16	0.20	0.05				
14.75	2.18	0.21	0.05				
15.00	2.20	0.22	0.05				
15.25	2.22	0.22	0.05				
15.50	2.24	0.23	0.05				
15.75	2.26	0.24	0.04				
16.00	2.27	0.24	0.04				
16.25	2.29	0.25	0.04				
16.50	2.30	0.25	0.04				
16.75	2.31	0.26	0.04				

Summary for Subcatchment 6S: DA-1

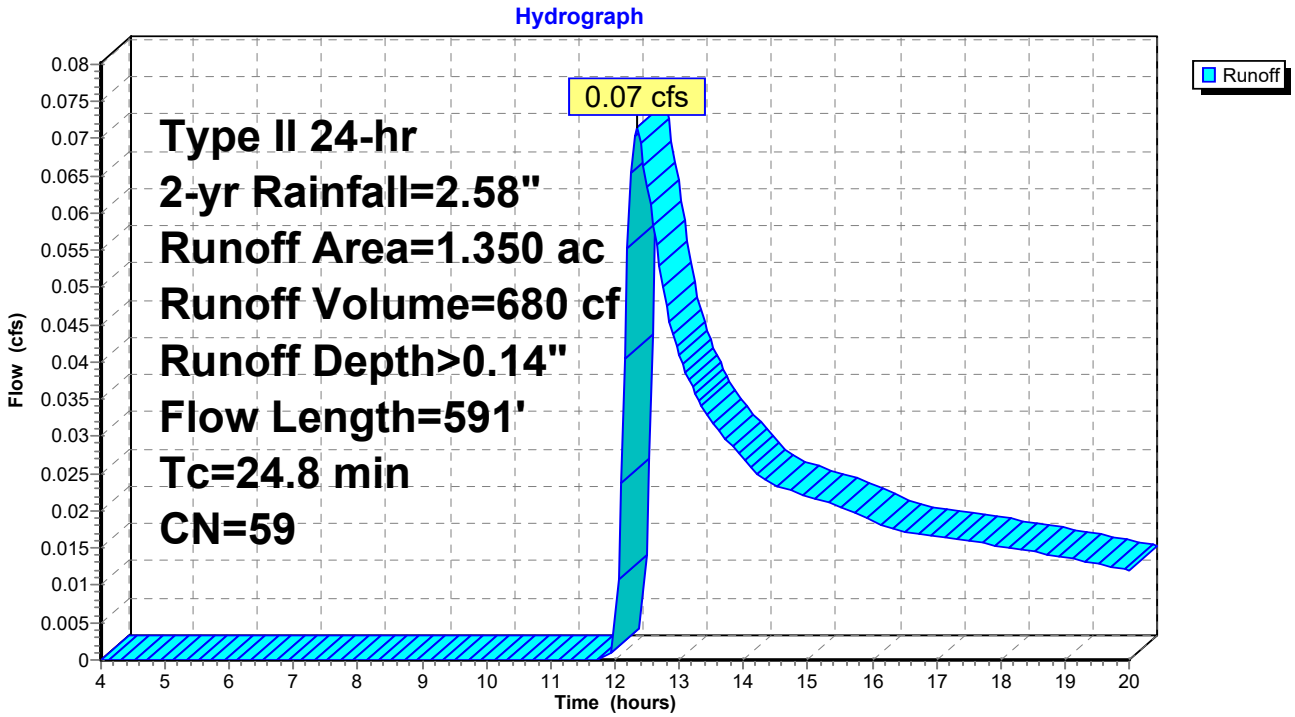
Runoff = 0.07 cfs @ 12.34 hrs, Volume= 680 cf, Depth> 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (ac)	CN	Description
0.992	60	Woods, Fair, HSG B
0.358	58	Meadow, non-grazed, HSG B
1.350	59	Weighted Average
1.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.1	100	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.9	143	0.1600	2.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.8	348	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	591	Total			

Subcatchment 6S: DA-1



Hydrograph for Subcatchment 6S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.12	0.00	0.00	17.00	2.33	0.11	0.02
4.25	0.13	0.00	0.00	17.25	2.34	0.11	0.02
4.50	0.14	0.00	0.00	17.50	2.35	0.12	0.02
4.75	0.15	0.00	0.00	17.75	2.36	0.12	0.02
5.00	0.16	0.00	0.00	18.00	2.38	0.12	0.02
5.25	0.17	0.00	0.00	18.25	2.39	0.13	0.01
5.50	0.18	0.00	0.00	18.50	2.40	0.13	0.01
5.75	0.19	0.00	0.00	18.75	2.41	0.13	0.01
6.00	0.21	0.00	0.00	19.00	2.42	0.13	0.01
6.25	0.22	0.00	0.00	19.25	2.43	0.14	0.01
6.50	0.23	0.00	0.00	19.50	2.44	0.14	0.01
6.75	0.24	0.00	0.00	19.75	2.45	0.14	0.01
7.00	0.26	0.00	0.00	20.00	**2.46**	**0.14**	0.01
7.25	0.27	0.00	0.00				
7.50	0.28	0.00	0.00				
7.75	0.30	0.00	0.00				
8.00	0.31	0.00	0.00				
8.25	0.32	0.00	0.00				
8.50	0.34	0.00	0.00				
8.75	0.36	0.00	0.00				
9.00	0.38	0.00	0.00				
9.25	0.40	0.00	0.00				
9.50	0.42	0.00	0.00				
9.75	0.44	0.00	0.00				
10.00	0.47	0.00	0.00				
10.25	0.49	0.00	0.00				
10.50	0.53	0.00	0.00				
10.75	0.56	0.00	0.00				
11.00	0.61	0.00	0.00				
11.25	0.66	0.00	0.00				
11.50	0.73	0.00	0.00				
11.75	1.00	0.00	0.00				
12.00	1.71	0.01	0.00				
12.25	1.82	0.03	**0.07**				
12.50	1.90	0.03	**0.06**				
12.75	1.95	0.04	0.05				
13.00	1.99	0.05	0.04				
13.25	2.03	0.05	0.04				
13.50	2.06	0.06	0.03				
13.75	2.09	0.06	0.03				
14.00	2.12	0.07	0.03				
14.25	2.14	0.07	0.02				
14.50	2.16	0.08	0.02				
14.75	2.18	0.08	0.02				
15.00	2.20	0.08	0.02				
15.25	2.22	0.09	0.02				
15.50	2.24	0.09	0.02				
15.75	2.26	0.10	0.02				
16.00	2.27	0.10	0.02				
16.25	2.29	0.10	0.02				
16.50	2.30	0.11	0.02				
16.75	2.31	0.11	0.02				

Summary for Subcatchment 7S: DA-2

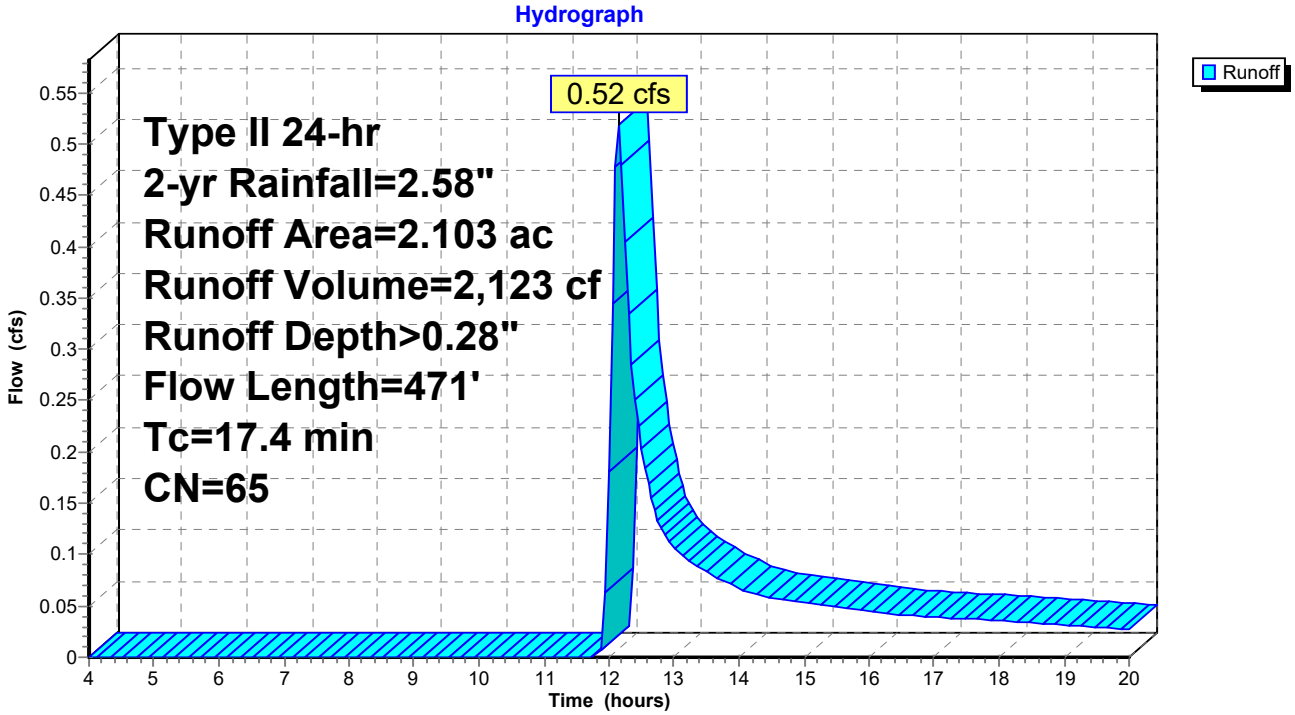
Runoff = 0.52 cfs @ 12.15 hrs, Volume= 2,123 cf, Depth> 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.12	0.00	0.00	17.00	2.33	0.24	0.04
4.25	0.13	0.00	0.00	17.25	2.34	0.24	0.04
4.50	0.14	0.00	0.00	17.50	2.35	0.24	0.04
4.75	0.15	0.00	0.00	17.75	2.36	0.25	0.04
5.00	0.16	0.00	0.00	18.00	2.38	0.25	0.04
5.25	0.17	0.00	0.00	18.25	2.39	0.26	0.03
5.50	0.18	0.00	0.00	18.50	2.40	0.26	0.03
5.75	0.19	0.00	0.00	18.75	2.41	0.26	0.03
6.00	0.21	0.00	0.00	19.00	2.42	0.27	0.03
6.25	0.22	0.00	0.00	19.25	2.43	0.27	0.03
6.50	0.23	0.00	0.00	19.50	2.44	0.27	0.03
6.75	0.24	0.00	0.00	19.75	2.45	0.28	0.03
7.00	0.26	0.00	0.00	20.00	**2.46**	**0.28**	0.03
7.25	0.27	0.00	0.00				
7.50	0.28	0.00	0.00				
7.75	0.30	0.00	0.00				
8.00	0.31	0.00	0.00				
8.25	0.32	0.00	0.00				
8.50	0.34	0.00	0.00				
8.75	0.36	0.00	0.00				
9.00	0.38	0.00	0.00				
9.25	0.40	0.00	0.00				
9.50	0.42	0.00	0.00				
9.75	0.44	0.00	0.00				
10.00	0.47	0.00	0.00				
10.25	0.49	0.00	0.00				
10.50	0.53	0.00	0.00				
10.75	0.56	0.00	0.00				
11.00	0.61	0.00	0.00				
11.25	0.66	0.00	0.00				
11.50	0.73	0.00	0.00				
11.75	1.00	0.00	0.00				
12.00	1.71	0.07	**0.18**				
12.25	1.82	0.09	**0.40**				
12.50	1.90	0.11	0.20				
12.75	1.95	0.12	0.13				
13.00	1.99	0.13	0.11				
13.25	2.03	0.14	0.09				
13.50	2.06	0.15	0.08				
13.75	2.09	0.16	0.07				
14.00	2.12	0.17	0.07				
14.25	2.14	0.17	0.06				
14.50	2.16	0.18	0.06				
14.75	2.18	0.19	0.06				
15.00	2.20	0.19	0.05				
15.25	2.22	0.20	0.05				
15.50	2.24	0.21	0.05				
15.75	2.26	0.21	0.05				
16.00	2.27	0.22	0.04				
16.25	2.29	0.22	0.04				
16.50	2.30	0.23	0.04				
16.75	2.31	0.23	0.04				

Summary for Subcatchment 10S: DA-2

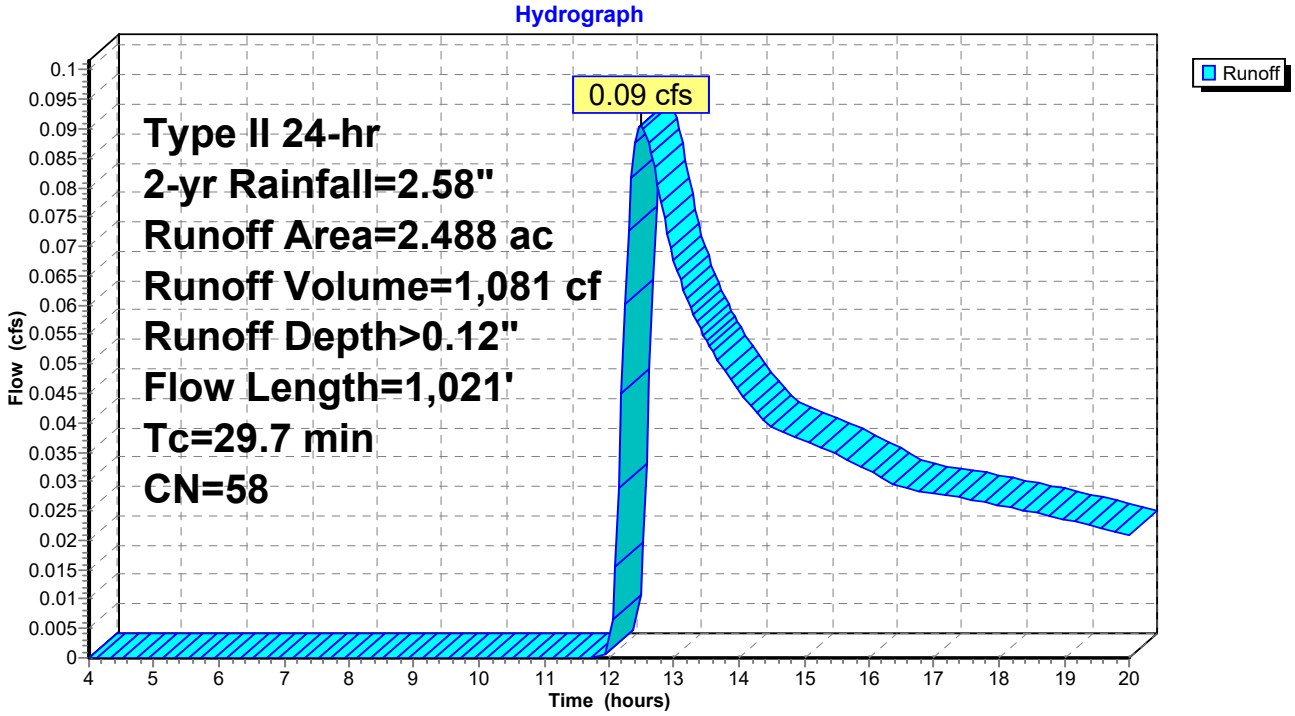
Runoff = 0.09 cfs @ 12.48 hrs, Volume= 1,081 cf, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (ac)	CN	Description
2.040	58	Meadow, non-grazed, HSG B
0.448	60	Woods, Fair, HSG B
2.488	58	Weighted Average
2.488		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.3	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
9.4	921	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.7	1,021	Total			

Subcatchment 10S: DA-2



Hydrograph for Subcatchment 10S: DA-2

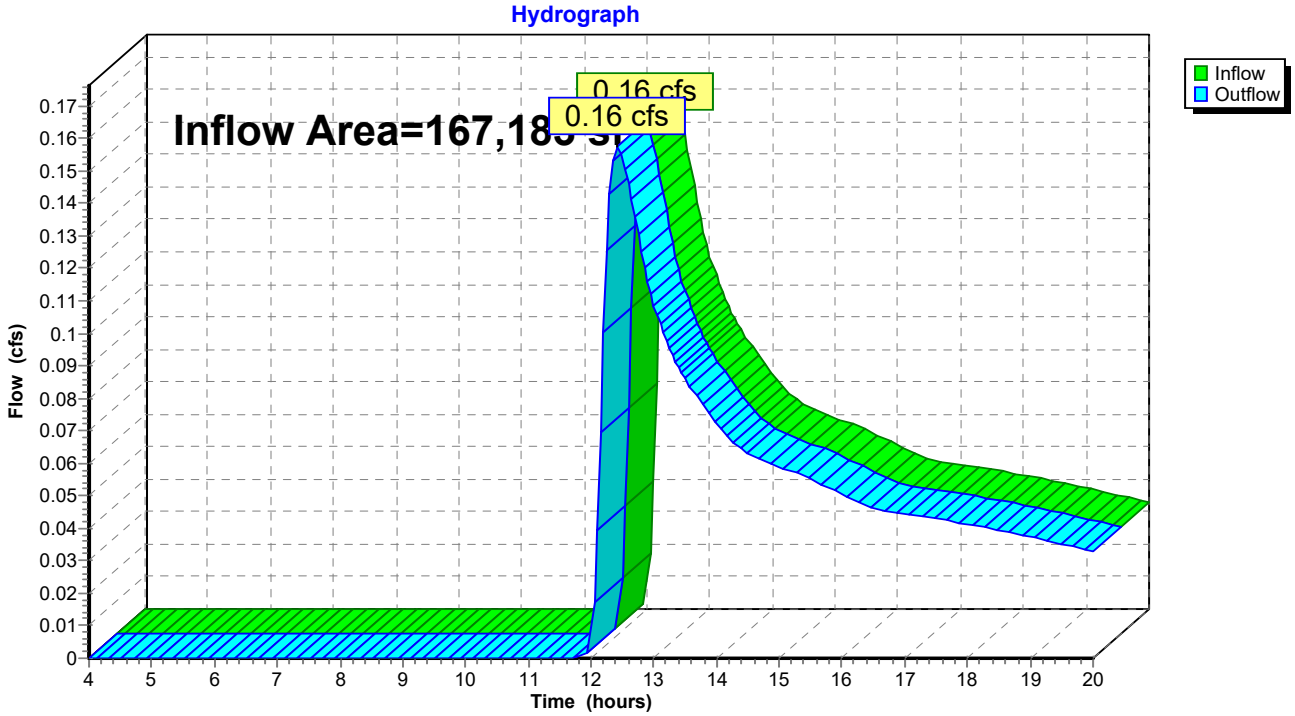
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.12	0.00	0.00	17.00	2.33	0.09	0.03
4.25	0.13	0.00	0.00	17.25	2.34	0.10	0.03
4.50	0.14	0.00	0.00	17.50	2.35	0.10	0.03
4.75	0.15	0.00	0.00	17.75	2.36	0.10	0.03
5.00	0.16	0.00	0.00	18.00	2.38	0.11	0.03
5.25	0.17	0.00	0.00	18.25	2.39	0.11	0.03
5.50	0.18	0.00	0.00	18.50	2.40	0.11	0.02
5.75	0.19	0.00	0.00	18.75	2.41	0.11	0.02
6.00	0.21	0.00	0.00	19.00	2.42	0.11	0.02
6.25	0.22	0.00	0.00	19.25	2.43	0.12	0.02
6.50	0.23	0.00	0.00	19.50	2.44	0.12	0.02
6.75	0.24	0.00	0.00	19.75	2.45	0.12	0.02
7.00	0.26	0.00	0.00	20.00	**2.46**	**0.12**	0.02
7.25	0.27	0.00	0.00				
7.50	0.28	0.00	0.00				
7.75	0.30	0.00	0.00				
8.00	0.31	0.00	0.00				
8.25	0.32	0.00	0.00				
8.50	0.34	0.00	0.00				
8.75	0.36	0.00	0.00				
9.00	0.38	0.00	0.00				
9.25	0.40	0.00	0.00				
9.50	0.42	0.00	0.00				
9.75	0.44	0.00	0.00				
10.00	0.47	0.00	0.00				
10.25	0.49	0.00	0.00				
10.50	0.53	0.00	0.00				
10.75	0.56	0.00	0.00				
11.00	0.61	0.00	0.00				
11.25	0.66	0.00	0.00				
11.50	0.73	0.00	0.00				
11.75	1.00	0.00	0.00				
12.00	1.71	0.01	0.00				
12.25	1.82	0.02	0.06				
12.50	1.90	0.03	**0.09**				
12.75	1.95	0.03	0.08				
13.00	1.99	0.04	0.07				
13.25	2.03	0.04	0.06				
13.50	2.06	0.05	0.05				
13.75	2.09	0.05	0.05				
14.00	2.12	0.06	0.05				
14.25	2.14	0.06	0.04				
14.50	2.16	0.06	0.04				
14.75	2.18	0.07	0.04				
15.00	2.20	0.07	0.04				
15.25	2.22	0.07	0.04				
15.50	2.24	0.08	0.03				
15.75	2.26	0.08	0.03				
16.00	2.27	0.08	0.03				
16.25	2.29	0.09	0.03				
16.50	2.30	0.09	0.03				
16.75	2.31	0.09	0.03				

Summary for Reach 9R: Pre

Inflow Area = 167,183 sf, 0.00% Impervious, Inflow Depth > 0.13" for 2-yr event
Inflow = 0.16 cfs @ 12.42 hrs, Volume= 1,761 cf
Outflow = 0.16 cfs @ 12.42 hrs, Volume= 1,761 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 9R: Pre



Hydrograph for Reach 9R: Pre

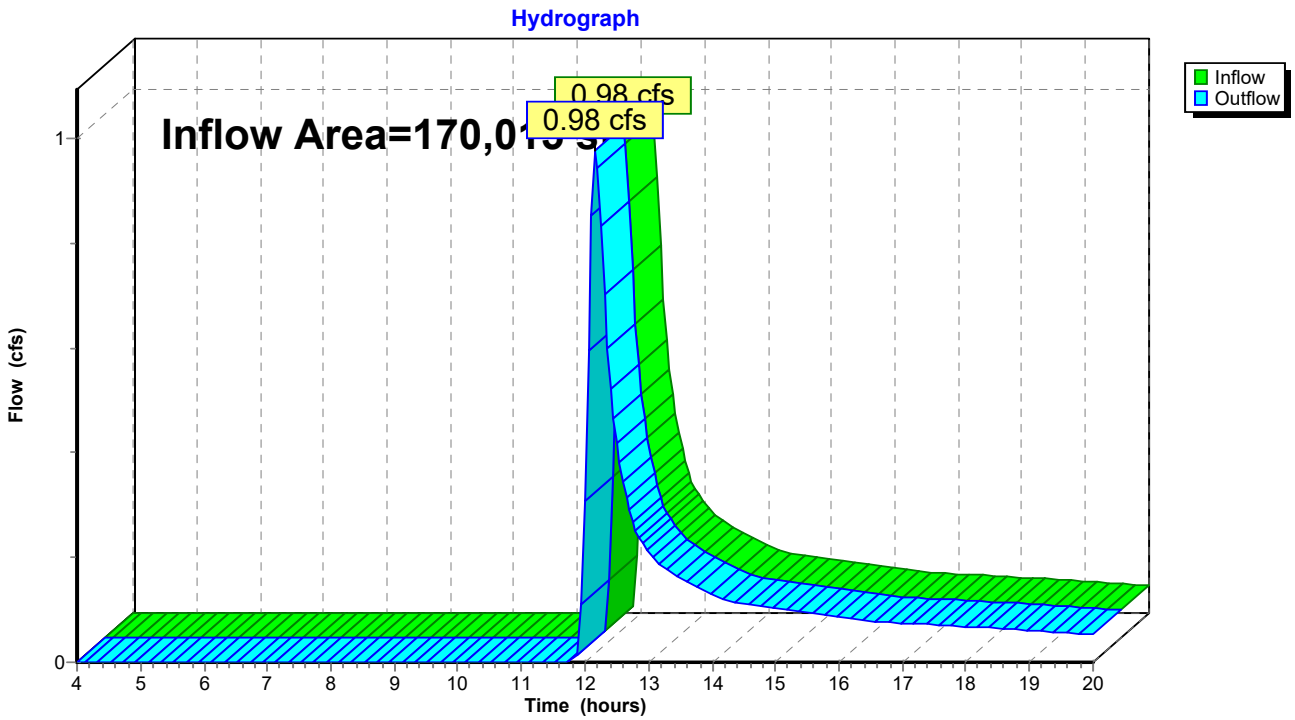
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.04		0.04
4.25	0.00		0.00	17.25	0.04		0.04
4.50	0.00		0.00	17.50	0.04		0.04
4.75	0.00		0.00	17.75	0.04		0.04
5.00	0.00		0.00	18.00	0.04		0.04
5.25	0.00		0.00	18.25	0.04		0.04
5.50	0.00		0.00	18.50	0.04		0.04
5.75	0.00		0.00	18.75	0.04		0.04
6.00	0.00		0.00	19.00	0.04		0.04
6.25	0.00		0.00	19.25	0.04		0.04
6.50	0.00		0.00	19.50	0.04		0.04
6.75	0.00		0.00	19.75	0.03		0.03
7.00	0.00		0.00	20.00	0.03		0.03
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.00		0.00				
12.00	0.01		0.01				
12.25	**0.13**		**0.13**				
12.50	**0.15**		**0.15**				
12.75	0.13		0.13				
13.00	0.11		0.11				
13.25	0.10		0.10				
13.50	0.09		0.09				
13.75	0.08		0.08				
14.00	0.07		0.07				
14.25	0.07		0.07				
14.50	0.06		0.06				
14.75	0.06		0.06				
15.00	0.06		0.06				
15.25	0.06		0.06				
15.50	0.06		0.06				
15.75	0.05		0.05				
16.00	0.05		0.05				
16.25	0.05		0.05				
16.50	0.05		0.05				
16.75	0.05		0.05				

Summary for Reach 14R: Post

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 0.29" for 2-yr event
Inflow = 0.98 cfs @ 12.17 hrs, Volume= 4,118 cf
Outflow = 0.98 cfs @ 12.17 hrs, Volume= 4,118 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post



Hydrograph for Reach 14R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.07		0.07
4.25	0.00		0.00	17.25	0.07		0.07
4.50	0.00		0.00	17.50	0.07		0.07
4.75	0.00		0.00	17.75	0.07		0.07
5.00	0.00		0.00	18.00	0.07		0.07
5.25	0.00		0.00	18.25	0.07		0.07
5.50	0.00		0.00	18.50	0.06		0.06
5.75	0.00		0.00	18.75	0.06		0.06
6.00	0.00		0.00	19.00	0.06		0.06
6.25	0.00		0.00	19.25	0.06		0.06
6.50	0.00		0.00	19.50	0.06		0.06
6.75	0.00		0.00	19.75	0.05		0.05
7.00	0.00		0.00	20.00	0.05		0.05
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.00		0.00				
12.00	**0.31**		**0.31**				
12.25	**0.83**		**0.83**				
12.50	0.42		0.42				
12.75	0.27		0.27				
13.00	0.21		0.21				
13.25	0.18		0.18				
13.50	0.16		0.16				
13.75	0.14		0.14				
14.00	0.13		0.13				
14.25	0.12		0.12				
14.50	0.11		0.11				
14.75	0.11		0.11				
15.00	0.10		0.10				
15.25	0.10		0.10				
15.50	0.10		0.10				
15.75	0.09		0.09				
16.00	0.09		0.09				
16.25	0.08		0.08				
16.50	0.08		0.08				
16.75	0.08		0.08				

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=861' Tc=20.5 min CN=66 Runoff=1.53 cfs 5,123 cf

Subcatchment 6S: DA-1 Runoff Area=1.350 ac 0.00% Impervious Runoff Depth>0.48"
Flow Length=591' Tc=24.8 min CN=59 Runoff=0.51 cfs 2,342 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>0.74"
Flow Length=471' Tc=17.4 min CN=65 Runoff=1.83 cfs 5,630 cf

Subcatchment 10S: DA-2 Runoff Area=2.488 ac 0.00% Impervious Runoff Depth>0.44"
Flow Length=1,021' Tc=29.7 min CN=58 Runoff=0.72 cfs 3,959 cf

Reach 9R: Pre Inflow=1.20 cfs 6,301 cf
Outflow=1.20 cfs 6,301 cf

Reach 14R: Post Inflow=3.33 cfs 10,753 cf
Outflow=3.33 cfs 10,753 cf

Total Runoff Area = 337,198 sf Runoff Volume = 17,054 cf Average Runoff Depth = 0.61"
100.00% Pervious = 337,198 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

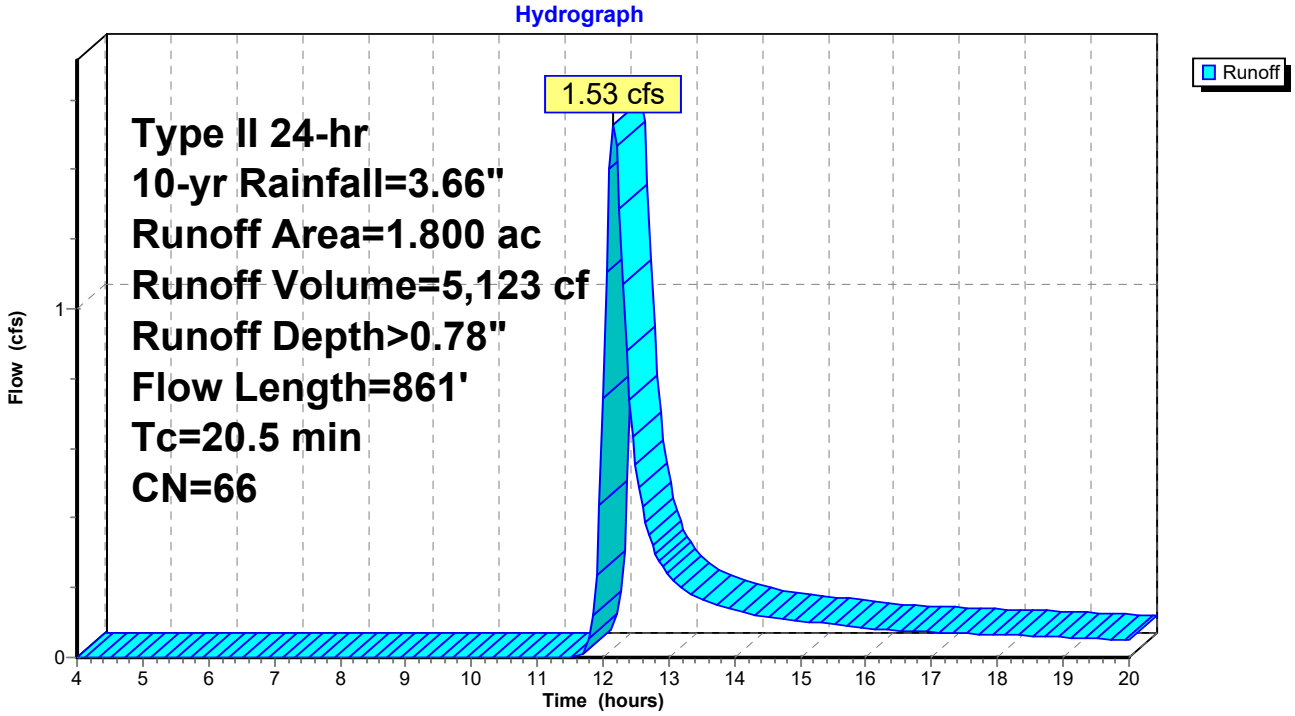
Runoff = 1.53 cfs @ 12.16 hrs, Volume= 5,123 cf, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00	17.00	3.30	0.69	0.07
4.25	0.19	0.00	0.00	17.25	3.32	0.70	0.07
4.50	0.20	0.00	0.00	17.50	3.34	0.71	0.07
4.75	0.22	0.00	0.00	17.75	3.35	0.72	0.07
5.00	0.23	0.00	0.00	18.00	3.37	0.73	0.07
5.25	0.25	0.00	0.00	18.25	3.39	0.74	0.06
5.50	0.26	0.00	0.00	18.50	3.40	0.75	0.06
5.75	0.28	0.00	0.00	18.75	3.42	0.76	0.06
6.00	0.29	0.00	0.00	19.00	3.43	0.76	0.06
6.25	0.31	0.00	0.00	19.25	3.45	0.77	0.06
6.50	0.33	0.00	0.00	19.50	3.46	0.78	0.05
6.75	0.34	0.00	0.00	19.75	3.47	0.79	0.05
7.00	0.36	0.00	0.00	20.00	**3.48**	**0.79**	0.05
7.25	0.38	0.00	0.00				
7.50	0.40	0.00	0.00				
7.75	0.42	0.00	0.00				
8.00	0.44	0.00	0.00				
8.25	0.46	0.00	0.00				
8.50	0.48	0.00	0.00				
8.75	0.51	0.00	0.00				
9.00	0.54	0.00	0.00				
9.25	0.57	0.00	0.00				
9.50	0.60	0.00	0.00				
9.75	0.63	0.00	0.00				
10.00	0.66	0.00	0.00				
10.25	0.70	0.00	0.00				
10.50	0.75	0.00	0.00				
10.75	0.80	0.00	0.00				
11.00	0.86	0.00	0.00				
11.25	0.94	0.00	0.00				
11.50	1.04	0.00	0.00				
11.75	1.42	0.03	0.02				
12.00	2.43	0.30	**0.75**				
12.25	2.58	0.36	**1.29**				
12.50	2.69	0.40	0.55				
12.75	2.76	0.44	0.32				
13.00	2.83	0.46	0.23				
13.25	2.88	0.49	0.19				
13.50	2.92	0.51	0.17				
13.75	2.97	0.53	0.15				
14.00	3.00	0.55	0.14				
14.25	3.03	0.56	0.12				
14.50	3.07	0.58	0.11				
14.75	3.10	0.59	0.11				
15.00	3.12	0.60	0.10				
15.25	3.15	0.62	0.10				
15.50	3.18	0.63	0.09				
15.75	3.20	0.64	0.09				
16.00	3.22	0.65	0.08				
16.25	3.24	0.66	0.08				
16.50	3.26	0.67	0.08				
16.75	3.28	0.68	0.07				

Summary for Subcatchment 6S: DA-1

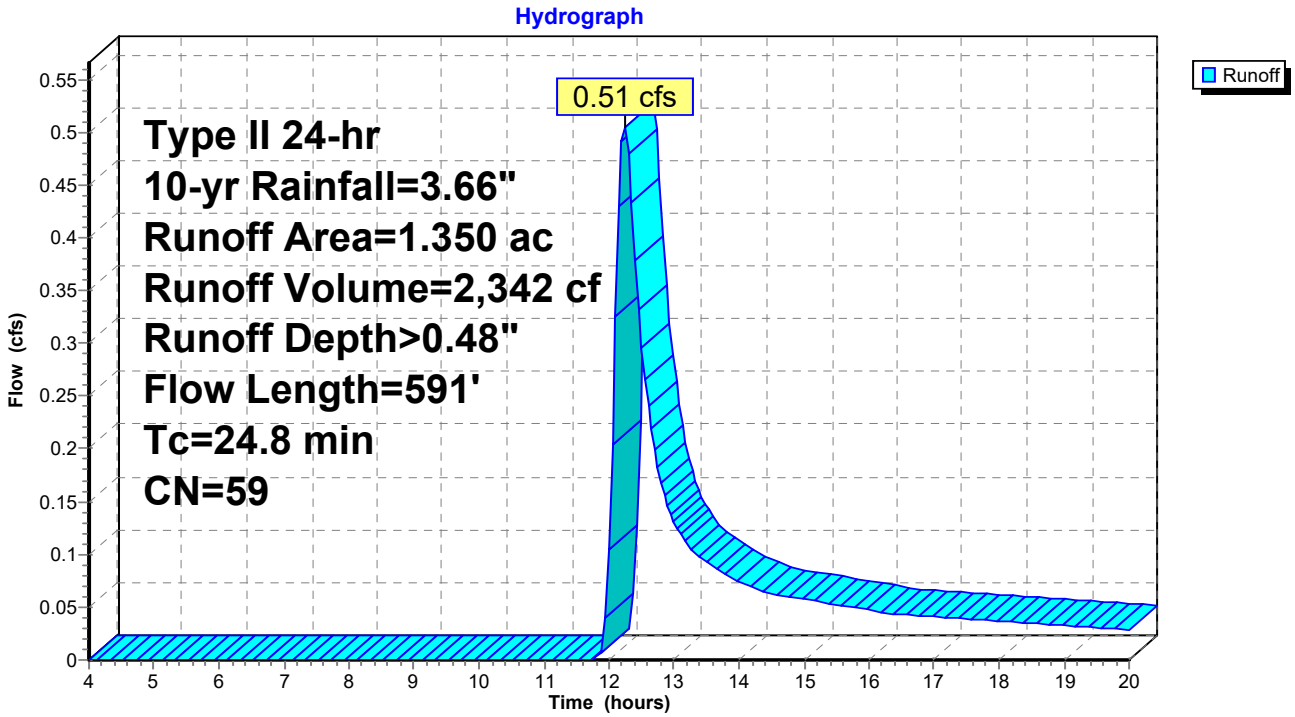
Runoff = 0.51 cfs @ 12.24 hrs, Volume= 2,342 cf, Depth> 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (ac)	CN	Description
0.992	60	Woods, Fair, HSG B
0.358	58	Meadow, non-grazed, HSG B
1.350	59	Weighted Average
1.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.1	100	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.9	143	0.1600	2.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.8	348	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	591	Total			

Subcatchment 6S: DA-1



Hydrograph for Subcatchment 6S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00	17.00	3.30	0.41	0.04
4.25	0.19	0.00	0.00	17.25	3.32	0.42	0.04
4.50	0.20	0.00	0.00	17.50	3.34	0.43	0.04
4.75	0.22	0.00	0.00	17.75	3.35	0.43	0.04
5.00	0.23	0.00	0.00	18.00	3.37	0.44	0.04
5.25	0.25	0.00	0.00	18.25	3.39	0.45	0.04
5.50	0.26	0.00	0.00	18.50	3.40	0.45	0.03
5.75	0.28	0.00	0.00	18.75	3.42	0.46	0.03
6.00	0.29	0.00	0.00	19.00	3.43	0.46	0.03
6.25	0.31	0.00	0.00	19.25	3.45	0.47	0.03
6.50	0.33	0.00	0.00	19.50	3.46	0.47	0.03
6.75	0.34	0.00	0.00	19.75	3.47	0.48	0.03
7.00	0.36	0.00	0.00	20.00	**3.48**	**0.49**	0.03
7.25	0.38	0.00	0.00				
7.50	0.40	0.00	0.00				
7.75	0.42	0.00	0.00				
8.00	0.44	0.00	0.00				
8.25	0.46	0.00	0.00				
8.50	0.48	0.00	0.00				
8.75	0.51	0.00	0.00				
9.00	0.54	0.00	0.00				
9.25	0.57	0.00	0.00				
9.50	0.60	0.00	0.00				
9.75	0.63	0.00	0.00				
10.00	0.66	0.00	0.00				
10.25	0.70	0.00	0.00				
10.50	0.75	0.00	0.00				
10.75	0.80	0.00	0.00				
11.00	0.86	0.00	0.00				
11.25	0.94	0.00	0.00				
11.50	1.04	0.00	0.00				
11.75	1.42	0.00	0.00				
12.00	2.43	0.13	0.10				
12.25	2.58	0.18	**0.50**				
12.50	2.69	0.20	0.30				
12.75	2.76	0.23	0.18				
13.00	2.83	0.25	0.13				
13.25	2.88	0.26	0.11				
13.50	2.92	0.28	0.09				
13.75	2.97	0.29	0.08				
14.00	3.00	0.30	0.07				
14.25	3.03	0.31	0.07				
14.50	3.07	0.33	0.06				
14.75	3.10	0.34	0.06				
15.00	3.12	0.35	0.06				
15.25	3.15	0.36	0.06				
15.50	3.18	0.37	0.05				
15.75	3.20	0.37	0.05				
16.00	3.22	0.38	0.05				
16.25	3.24	0.39	0.04				
16.50	3.26	0.40	0.04				
16.75	3.28	0.40	0.04				

Summary for Subcatchment 7S: DA-2

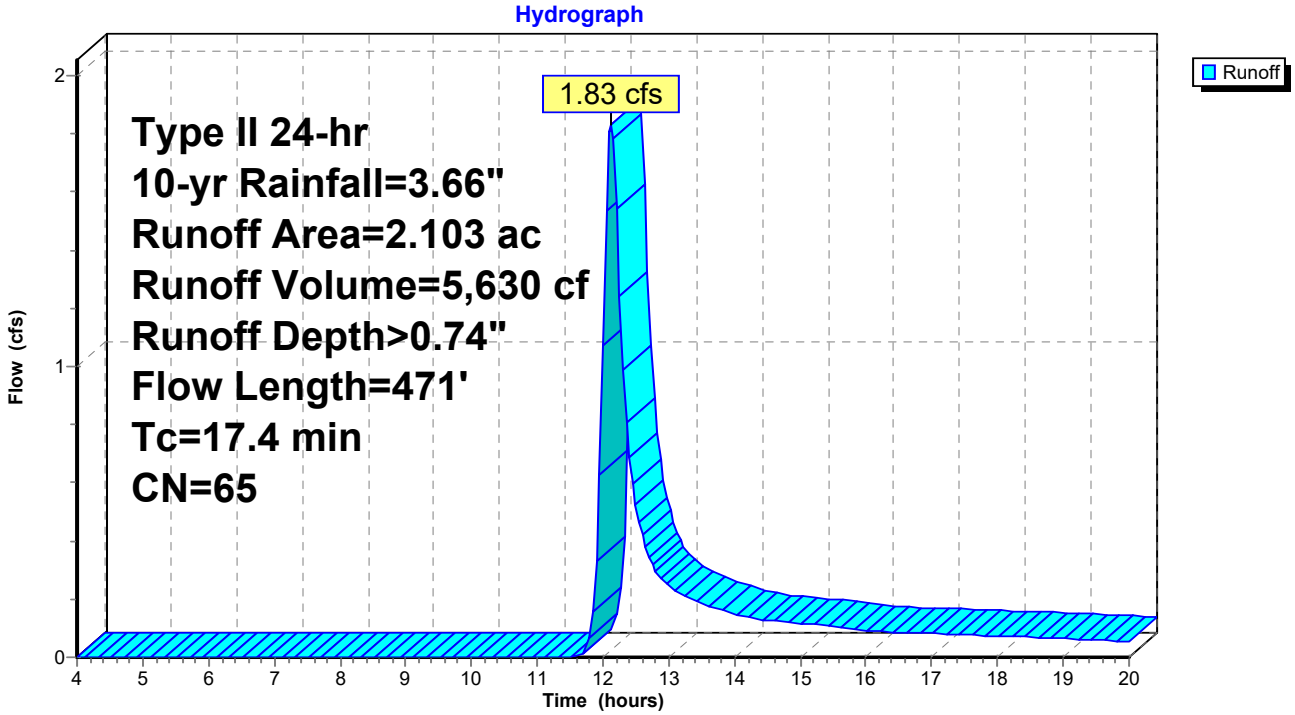
Runoff = 1.83 cfs @ 12.12 hrs, Volume= 5,630 cf, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00	17.00	3.30	0.65	0.08
4.25	0.19	0.00	0.00	17.25	3.32	0.66	0.08
4.50	0.20	0.00	0.00	17.50	3.34	0.67	0.08
4.75	0.22	0.00	0.00	17.75	3.35	0.68	0.08
5.00	0.23	0.00	0.00	18.00	3.37	0.69	0.07
5.25	0.25	0.00	0.00	18.25	3.39	0.69	0.07
5.50	0.26	0.00	0.00	18.50	3.40	0.70	0.07
5.75	0.28	0.00	0.00	18.75	3.42	0.71	0.07
6.00	0.29	0.00	0.00	19.00	3.43	0.72	0.06
6.25	0.31	0.00	0.00	19.25	3.45	0.72	0.06
6.50	0.33	0.00	0.00	19.50	3.46	0.73	0.06
6.75	0.34	0.00	0.00	19.75	3.47	0.74	0.06
7.00	0.36	0.00	0.00	20.00	**3.48**	**0.74**	0.06
7.25	0.38	0.00	0.00				
7.50	0.40	0.00	0.00				
7.75	0.42	0.00	0.00				
8.00	0.44	0.00	0.00				
8.25	0.46	0.00	0.00				
8.50	0.48	0.00	0.00				
8.75	0.51	0.00	0.00				
9.00	0.54	0.00	0.00				
9.25	0.57	0.00	0.00				
9.50	0.60	0.00	0.00				
9.75	0.63	0.00	0.00				
10.00	0.66	0.00	0.00				
10.25	0.70	0.00	0.00				
10.50	0.75	0.00	0.00				
10.75	0.80	0.00	0.00				
11.00	0.86	0.00	0.00				
11.25	0.94	0.00	0.00				
11.50	1.04	0.00	0.00				
11.75	1.42	0.02	0.02				
12.00	2.43	0.27	**1.07**				
12.25	2.58	0.33	**1.24**				
12.50	2.69	0.37	0.52				
12.75	2.76	0.40	0.32				
13.00	2.83	0.43	0.25				
13.25	2.88	0.45	0.21				
13.50	2.92	0.47	0.19				
13.75	2.97	0.49	0.17				
14.00	3.00	0.51	0.15				
14.25	3.03	0.52	0.13				
14.50	3.07	0.54	0.13				
14.75	3.10	0.55	0.12				
15.00	3.12	0.56	0.12				
15.25	3.15	0.58	0.11				
15.50	3.18	0.59	0.11				
15.75	3.20	0.60	0.10				
16.00	3.22	0.61	0.09				
16.25	3.24	0.62	0.09				
16.50	3.26	0.63	0.09				
16.75	3.28	0.64	0.08				

Summary for Subcatchment 10S: DA-2

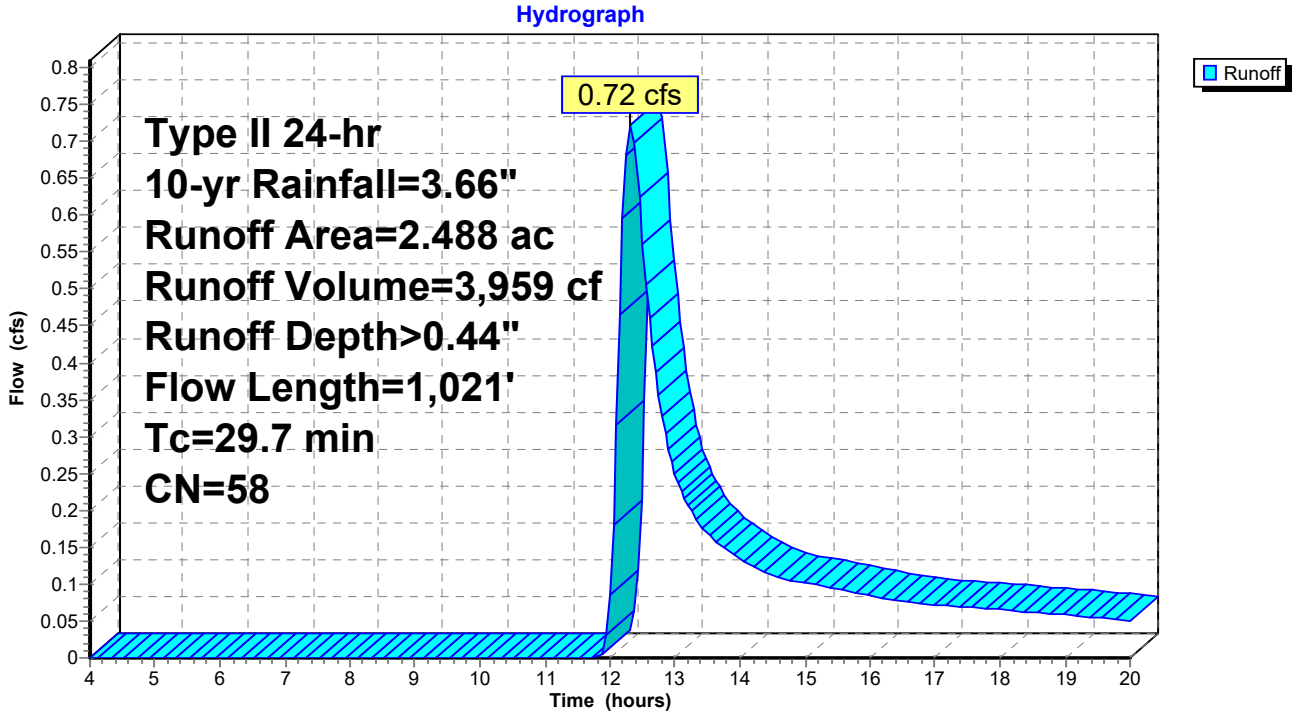
Runoff = 0.72 cfs @ 12.32 hrs, Volume= 3,959 cf, Depth> 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (ac)	CN	Description
2.040	58	Meadow, non-grazed, HSG B
0.448	60	Woods, Fair, HSG B
2.488	58	Weighted Average
2.488		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.3	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
9.4	921	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.7	1,021	Total			

Subcatchment 10S: DA-2



Hydrograph for Subcatchment 10S: DA-2

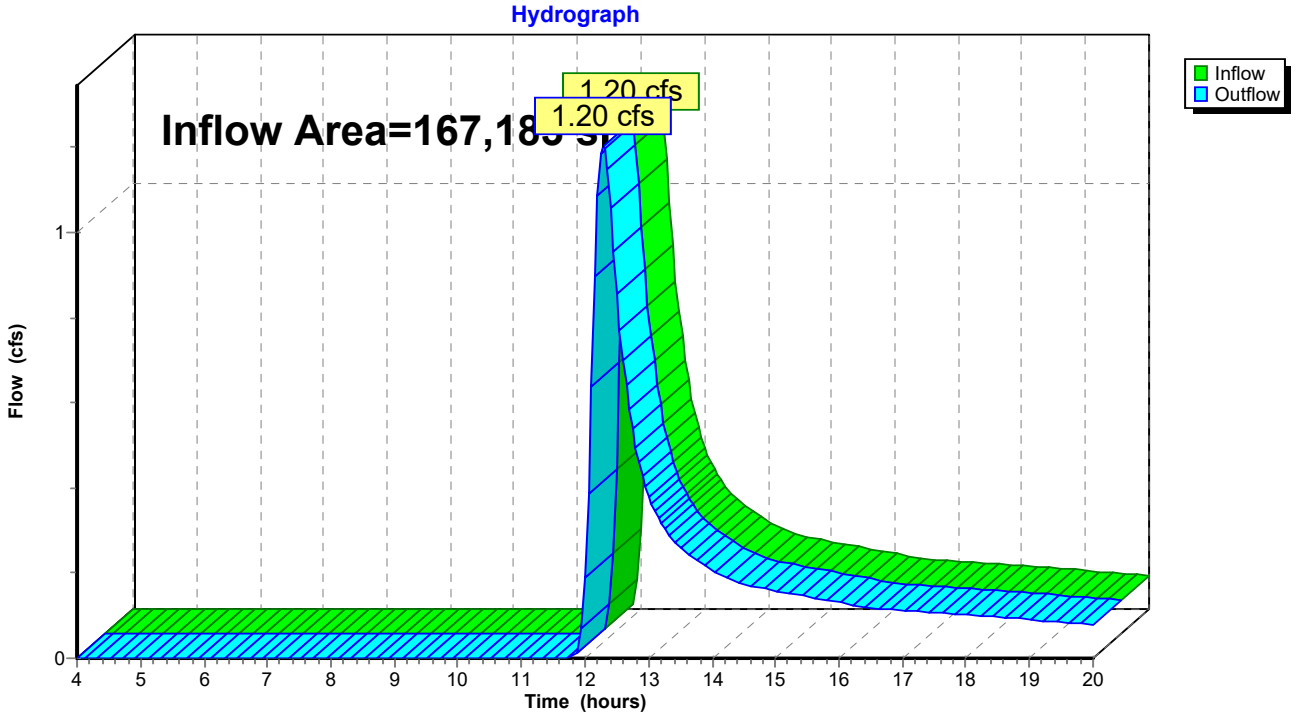
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00	17.00	3.30	0.38	0.07
4.25	0.19	0.00	0.00	17.25	3.32	0.38	0.07
4.50	0.20	0.00	0.00	17.50	3.34	0.39	0.07
4.75	0.22	0.00	0.00	17.75	3.35	0.40	0.07
5.00	0.23	0.00	0.00	18.00	3.37	0.40	0.07
5.25	0.25	0.00	0.00	18.25	3.39	0.41	0.06
5.50	0.26	0.00	0.00	18.50	3.40	0.42	0.06
5.75	0.28	0.00	0.00	18.75	3.42	0.42	0.06
6.00	0.29	0.00	0.00	19.00	3.43	0.43	0.06
6.25	0.31	0.00	0.00	19.25	3.45	0.43	0.06
6.50	0.33	0.00	0.00	19.50	3.46	0.44	0.05
6.75	0.34	0.00	0.00	19.75	3.47	0.44	0.05
7.00	0.36	0.00	0.00	20.00	**3.48**	**0.45**	0.05
7.25	0.38	0.00	0.00				
7.50	0.40	0.00	0.00				
7.75	0.42	0.00	0.00				
8.00	0.44	0.00	0.00				
8.25	0.46	0.00	0.00				
8.50	0.48	0.00	0.00				
8.75	0.51	0.00	0.00				
9.00	0.54	0.00	0.00				
9.25	0.57	0.00	0.00				
9.50	0.60	0.00	0.00				
9.75	0.63	0.00	0.00				
10.00	0.66	0.00	0.00				
10.25	0.70	0.00	0.00				
10.50	0.75	0.00	0.00				
10.75	0.80	0.00	0.00				
11.00	0.86	0.00	0.00				
11.25	0.94	0.00	0.00				
11.50	1.04	0.00	0.00				
11.75	1.42	0.00	0.00				
12.00	2.43	0.12	0.08				
12.25	2.58	0.15	**0.68**				
12.50	2.69	0.18	**0.56**				
12.75	2.76	0.20	0.36				
13.00	2.83	0.22	0.25				
13.25	2.88	0.24	0.20				
13.50	2.92	0.25	0.17				
13.75	2.97	0.26	0.15				
14.00	3.00	0.27	0.13				
14.25	3.03	0.28	0.12				
14.50	3.07	0.30	0.11				
14.75	3.10	0.31	0.11				
15.00	3.12	0.31	0.10				
15.25	3.15	0.32	0.10				
15.50	3.18	0.33	0.09				
15.75	3.20	0.34	0.09				
16.00	3.22	0.35	0.08				
16.25	3.24	0.36	0.08				
16.50	3.26	0.36	0.08				
16.75	3.28	0.37	0.07				

Summary for Reach 9R: Pre

Inflow Area = 167,183 sf, 0.00% Impervious, Inflow Depth > 0.45" for 10-yr event
Inflow = 1.20 cfs @ 12.28 hrs, Volume= 6,301 cf
Outflow = 1.20 cfs @ 12.28 hrs, Volume= 6,301 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 9R: Pre



Hydrograph for Reach 9R: Pre

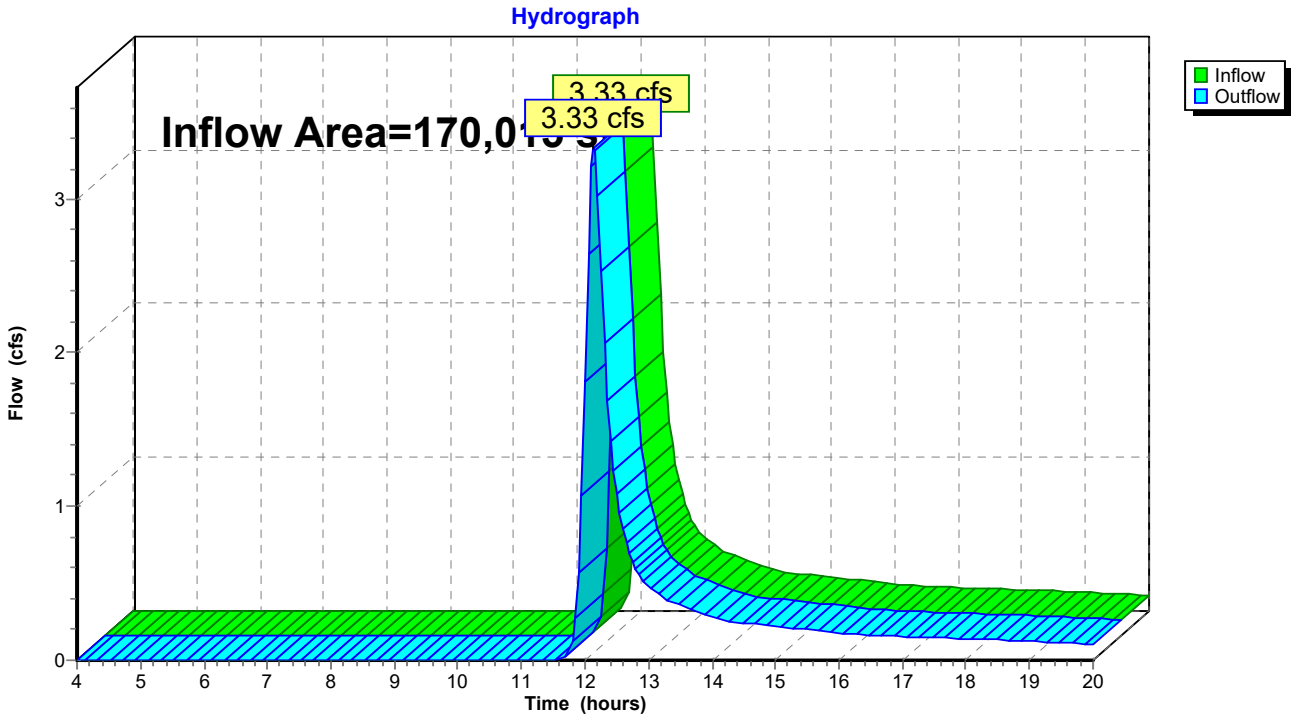
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.11		0.11
4.25	0.00		0.00	17.25	0.11		0.11
4.50	0.00		0.00	17.50	0.11		0.11
4.75	0.00		0.00	17.75	0.10		0.10
5.00	0.00		0.00	18.00	0.10		0.10
5.25	0.00		0.00	18.25	0.10		0.10
5.50	0.00		0.00	18.50	0.10		0.10
5.75	0.00		0.00	18.75	0.09		0.09
6.00	0.00		0.00	19.00	0.09		0.09
6.25	0.00		0.00	19.25	0.09		0.09
6.50	0.00		0.00	19.50	0.08		0.08
6.75	0.00		0.00	19.75	0.08		0.08
7.00	0.00		0.00	20.00	0.08		0.08
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.00		0.00				
12.00	0.19		0.19				
12.25	**1.19**		**1.19**				
12.50	**0.86**		**0.86**				
12.75	0.54		0.54				
13.00	0.38		0.38				
13.25	0.31		0.31				
13.50	0.26		0.26				
13.75	0.23		0.23				
14.00	0.21		0.21				
14.25	0.19		0.19				
14.50	0.17		0.17				
14.75	0.17		0.17				
15.00	0.16		0.16				
15.25	0.15		0.15				
15.50	0.15		0.15				
15.75	0.14		0.14				
16.00	0.13		0.13				
16.25	0.12		0.12				
16.50	0.12		0.12				
16.75	0.12		0.12				

Summary for Reach 14R: Post

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 0.76" for 10-yr event
Inflow = 3.33 cfs @ 12.14 hrs, Volume= 10,753 cf
Outflow = 3.33 cfs @ 12.14 hrs, Volume= 10,753 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post



Hydrograph for Reach 14R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.15		0.15
4.25	0.00		0.00	17.25	0.15		0.15
4.50	0.00		0.00	17.50	0.15		0.15
4.75	0.00		0.00	17.75	0.14		0.14
5.00	0.00		0.00	18.00	0.14		0.14
5.25	0.00		0.00	18.25	0.13		0.13
5.50	0.00		0.00	18.50	0.13		0.13
5.75	0.00		0.00	18.75	0.13		0.13
6.00	0.00		0.00	19.00	0.12		0.12
6.25	0.00		0.00	19.25	0.12		0.12
6.50	0.00		0.00	19.50	0.11		0.11
6.75	0.00		0.00	19.75	0.11		0.11
7.00	0.00		0.00	20.00	0.10		0.10
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.05		0.05				
12.00	**1.82**		**1.82**				
12.25	**2.53**		**2.53**				
12.50	1.08		1.08				
12.75	0.64		0.64				
13.00	0.48		0.48				
13.25	0.40		0.40				
13.50	0.36		0.36				
13.75	0.32		0.32				
14.00	0.28		0.28				
14.25	0.26		0.26				
14.50	0.24		0.24				
14.75	0.23		0.23				
15.00	0.22		0.22				
15.25	0.21		0.21				
15.50	0.20		0.20				
15.75	0.19		0.19				
16.00	0.18		0.18				
16.25	0.17		0.17				
16.50	0.16		0.16				
16.75	0.16		0.16				

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>1.17"
Flow Length=861' Tc=20.5 min CN=66 Runoff=2.39 cfs 7,623 cf

Subcatchment 6S: DA-1 Runoff Area=1.350 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=591' Tc=24.8 min CN=59 Runoff=0.94 cfs 3,796 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>1.11"
Flow Length=471' Tc=17.4 min CN=65 Runoff=2.90 cfs 8,463 cf

Subcatchment 10S: DA-2 Runoff Area=2.488 ac 0.00% Impervious Runoff Depth>0.72"
Flow Length=1,021' Tc=29.7 min CN=58 Runoff=1.39 cfs 6,524 cf

Reach 9R: Pre Inflow=2.30 cfs 10,320 cf
Outflow=2.30 cfs 10,320 cf

Reach 14R: Post Inflow=5.23 cfs 16,086 cf
Outflow=5.23 cfs 16,086 cf

Total Runoff Area = 337,198 sf Runoff Volume = 26,406 cf Average Runoff Depth = 0.94"
100.00% Pervious = 337,198 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

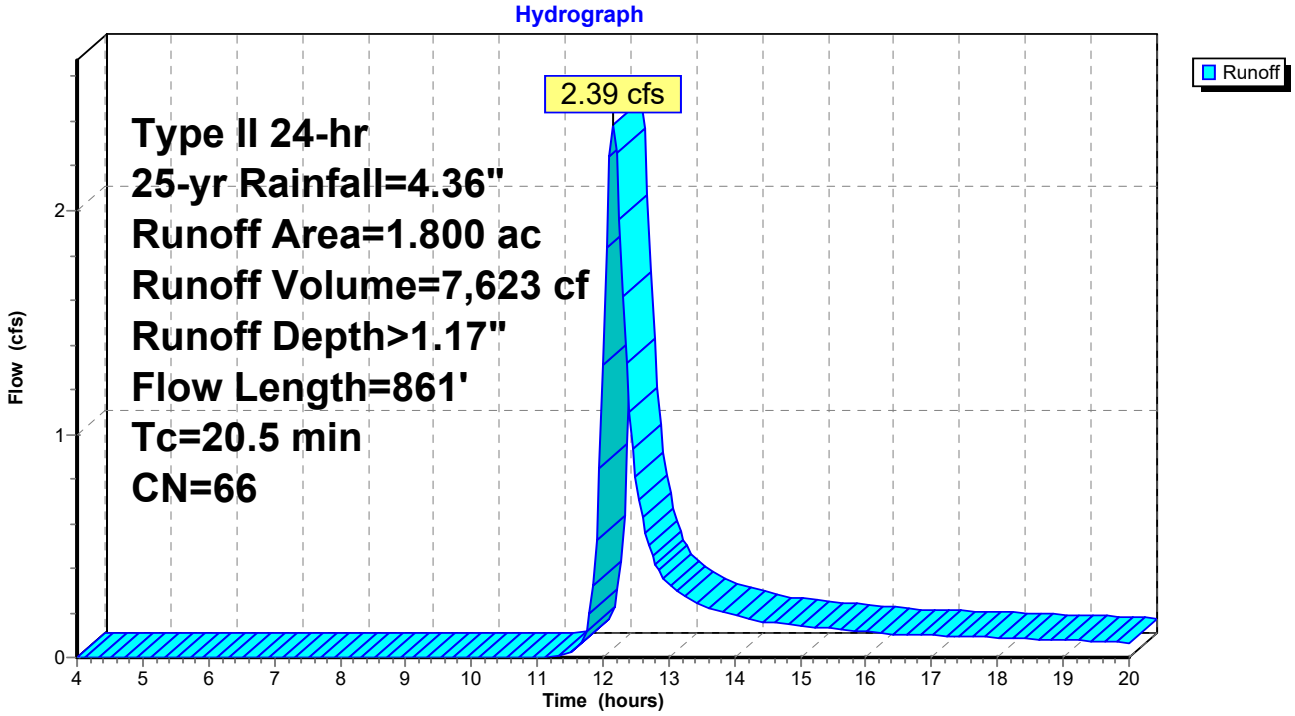
Runoff = 2.39 cfs @ 12.15 hrs, Volume= 7,623 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.21	0.00	0.00	17.00	3.93	1.05	0.10
4.25	0.22	0.00	0.00	17.25	3.95	1.06	0.10
4.50	0.24	0.00	0.00	17.50	3.97	1.07	0.09
4.75	0.26	0.00	0.00	17.75	4.00	1.08	0.09
5.00	0.27	0.00	0.00	18.00	4.02	1.10	0.09
5.25	0.29	0.00	0.00	18.25	4.03	1.11	0.09
5.50	0.31	0.00	0.00	18.50	4.05	1.12	0.08
5.75	0.33	0.00	0.00	18.75	4.07	1.13	0.08
6.00	0.35	0.00	0.00	19.00	4.09	1.14	0.08
6.25	0.37	0.00	0.00	19.25	4.11	1.15	0.08
6.50	0.39	0.00	0.00	19.50	4.12	1.16	0.07
6.75	0.41	0.00	0.00	19.75	4.14	1.17	0.07
7.00	0.43	0.00	0.00	20.00	**4.15**	**1.18**	0.07
7.25	0.45	0.00	0.00				
7.50	0.48	0.00	0.00				
7.75	0.50	0.00	0.00				
8.00	0.52	0.00	0.00				
8.25	0.55	0.00	0.00				
8.50	0.58	0.00	0.00				
8.75	0.61	0.00	0.00				
9.00	0.64	0.00	0.00				
9.25	0.68	0.00	0.00				
9.50	0.71	0.00	0.00				
9.75	0.75	0.00	0.00				
10.00	0.79	0.00	0.00				
10.25	0.84	0.00	0.00				
10.50	0.89	0.00	0.00				
10.75	0.95	0.00	0.00				
11.00	1.02	0.00	0.00				
11.25	1.12	0.00	0.00				
11.50	1.23	0.01	0.02				
11.75	1.69	0.07	0.12				
12.00	2.89	0.49	**1.31**				
12.25	3.08	0.58	**1.96**				
12.50	3.20	0.65	0.81				
12.75	3.29	0.69	0.46				
13.00	3.37	0.73	0.33				
13.25	3.43	0.76	0.27				
13.50	3.48	0.79	0.24				
13.75	3.53	0.82	0.21				
14.00	3.58	0.84	0.19				
14.25	3.61	0.86	0.17				
14.50	3.65	0.88	0.16				
14.75	3.69	0.90	0.15				
15.00	3.72	0.92	0.14				
15.25	3.75	0.94	0.14				
15.50	3.78	0.96	0.13				
15.75	3.81	0.97	0.12				
16.00	3.84	0.99	0.12				
16.25	3.86	1.00	0.11				
16.50	3.89	1.02	0.10				
16.75	3.91	1.03	0.10				

Summary for Subcatchment 6S: DA-1

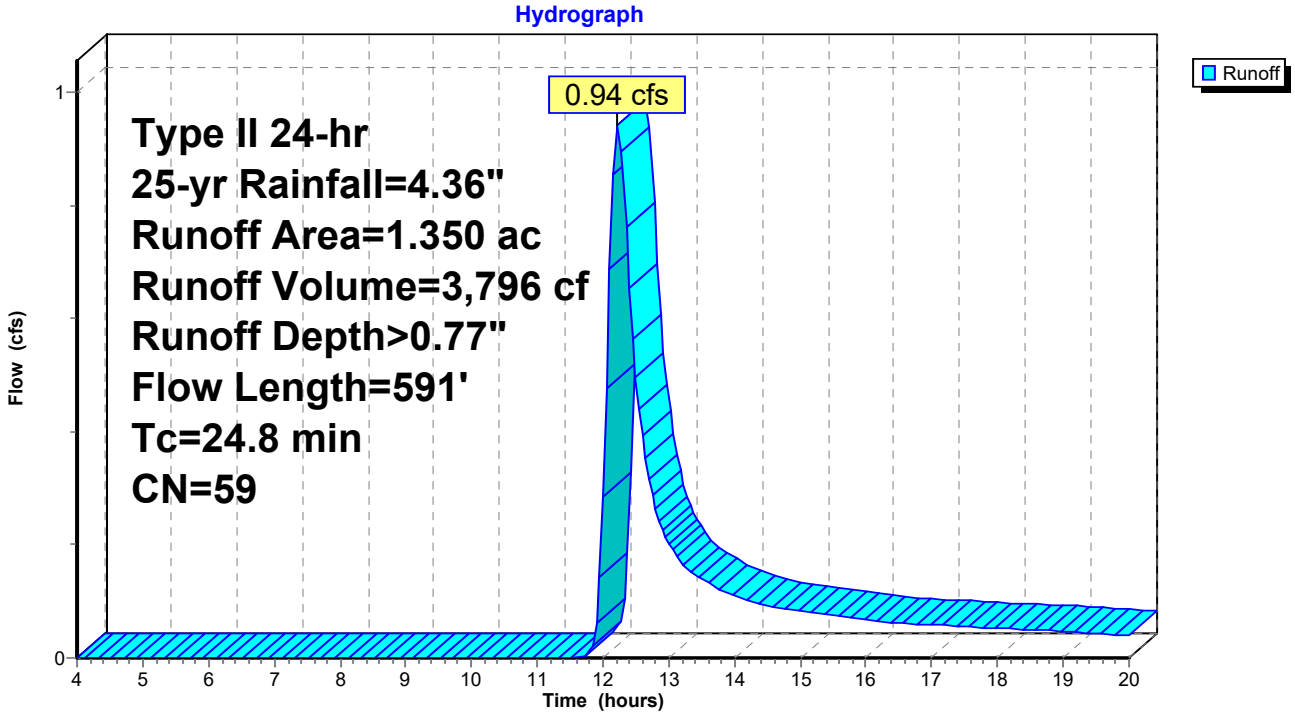
Runoff = 0.94 cfs @ 12.22 hrs, Volume= 3,796 cf, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (ac)	CN	Description
0.992	60	Woods, Fair, HSG B
0.358	58	Meadow, non-grazed, HSG B
1.350	59	Weighted Average
1.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.1	100	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.9	143	0.1600	2.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.8	348	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	591	Total			

Subcatchment 6S: DA-1



Hydrograph for Subcatchment 6S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.21	0.00	0.00
4.25	0.22	0.00	0.00
4.50	0.24	0.00	0.00
4.75	0.26	0.00	0.00
5.00	0.27	0.00	0.00
5.25	0.29	0.00	0.00
5.50	0.31	0.00	0.00
5.75	0.33	0.00	0.00
6.00	0.35	0.00	0.00
6.25	0.37	0.00	0.00
6.50	0.39	0.00	0.00
6.75	0.41	0.00	0.00
7.00	0.43	0.00	0.00
7.25	0.45	0.00	0.00
7.50	0.48	0.00	0.00
7.75	0.50	0.00	0.00
8.00	0.52	0.00	0.00
8.25	0.55	0.00	0.00
8.50	0.58	0.00	0.00
8.75	0.61	0.00	0.00
9.00	0.64	0.00	0.00
9.25	0.68	0.00	0.00
9.50	0.71	0.00	0.00
9.75	0.75	0.00	0.00
10.00	0.79	0.00	0.00
10.25	0.84	0.00	0.00
10.50	0.89	0.00	0.00
10.75	0.95	0.00	0.00
11.00	1.02	0.00	0.00
11.25	1.12	0.00	0.00
11.50	1.23	0.00	0.00
11.75	1.69	0.01	0.00
12.00	2.89	0.27	**0.28**
12.25	3.08	0.33	**0.93**
12.50	3.20	0.38	0.50
12.75	3.29	0.41	0.29
13.00	3.37	0.44	0.20
13.25	3.43	0.46	0.16
13.50	3.48	0.48	0.14
13.75	3.53	0.50	0.12
14.00	3.58	0.52	0.11
14.25	3.61	0.54	0.10
14.50	3.65	0.56	0.09
14.75	3.69	0.57	0.09
15.00	3.72	0.59	0.08
15.25	3.75	0.60	0.08
15.50	3.78	0.61	0.08
15.75	3.81	0.63	0.07
16.00	3.84	0.64	0.07
16.25	3.86	0.65	0.06
16.50	3.89	0.66	0.06
16.75	3.91	0.67	0.06
17.00	3.93	0.68	0.06
17.25	3.95	0.69	0.06
17.50	3.97	0.70	0.06
17.75	4.00	0.71	0.05
18.00	4.02	0.72	0.05
18.25	4.03	0.73	0.05
18.50	4.05	0.74	0.05
18.75	4.07	0.75	0.05
19.00	4.09	0.75	0.05
19.25	4.11	0.76	0.05
19.50	4.12	0.77	0.04
19.75	4.14	0.78	0.04
20.00	**4.15**	**0.79**	0.04

Summary for Subcatchment 7S: DA-2

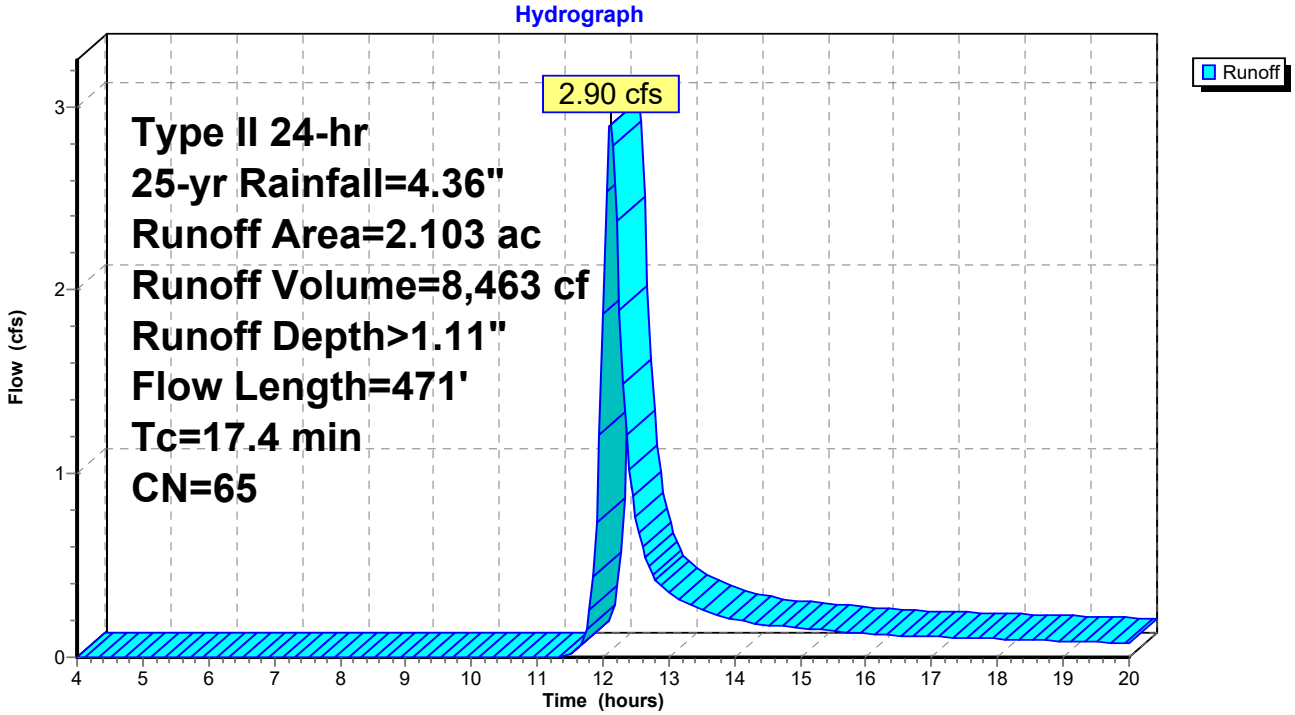
Runoff = 2.90 cfs @ 12.11 hrs, Volume= 8,463 cf, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.21	0.00	0.00	17.00	3.93	0.99	0.11
4.25	0.22	0.00	0.00	17.25	3.95	1.00	0.11
4.50	0.24	0.00	0.00	17.50	3.97	1.01	0.11
4.75	0.26	0.00	0.00	17.75	4.00	1.03	0.10
5.00	0.27	0.00	0.00	18.00	4.02	1.04	0.10
5.25	0.29	0.00	0.00	18.25	4.03	1.05	0.10
5.50	0.31	0.00	0.00	18.50	4.05	1.06	0.09
5.75	0.33	0.00	0.00	18.75	4.07	1.07	0.09
6.00	0.35	0.00	0.00	19.00	4.09	1.08	0.09
6.25	0.37	0.00	0.00	19.25	4.11	1.09	0.08
6.50	0.39	0.00	0.00	19.50	4.12	1.10	0.08
6.75	0.41	0.00	0.00	19.75	4.14	1.11	0.08
7.00	0.43	0.00	0.00	20.00	**4.15**	**1.12**	0.07
7.25	0.45	0.00	0.00				
7.50	0.48	0.00	0.00				
7.75	0.50	0.00	0.00				
8.00	0.52	0.00	0.00				
8.25	0.55	0.00	0.00				
8.50	0.58	0.00	0.00				
8.75	0.61	0.00	0.00				
9.00	0.64	0.00	0.00				
9.25	0.68	0.00	0.00				
9.50	0.71	0.00	0.00				
9.75	0.75	0.00	0.00				
10.00	0.79	0.00	0.00				
10.25	0.84	0.00	0.00				
10.50	0.89	0.00	0.00				
10.75	0.95	0.00	0.00				
11.00	1.02	0.00	0.00				
11.25	1.12	0.00	0.00				
11.50	1.23	0.00	0.01				
11.75	1.69	0.06	0.15				
12.00	2.89	0.46	**1.87**				
12.25	3.08	0.54	**1.89**				
12.50	3.20	0.60	0.76				
12.75	3.29	0.65	0.45				
13.00	3.37	0.68	0.35				
13.25	3.43	0.71	0.29				
13.50	3.48	0.74	0.26				
13.75	3.53	0.77	0.23				
14.00	3.58	0.79	0.21				
14.25	3.61	0.81	0.19				
14.50	3.65	0.83	0.18				
14.75	3.69	0.85	0.17				
15.00	3.72	0.87	0.16				
15.25	3.75	0.89	0.15				
15.50	3.78	0.91	0.15				
15.75	3.81	0.92	0.14				
16.00	3.84	0.94	0.13				
16.25	3.86	0.95	0.12				
16.50	3.89	0.96	0.12				
16.75	3.91	0.98	0.11				

Summary for Subcatchment 10S: DA-2

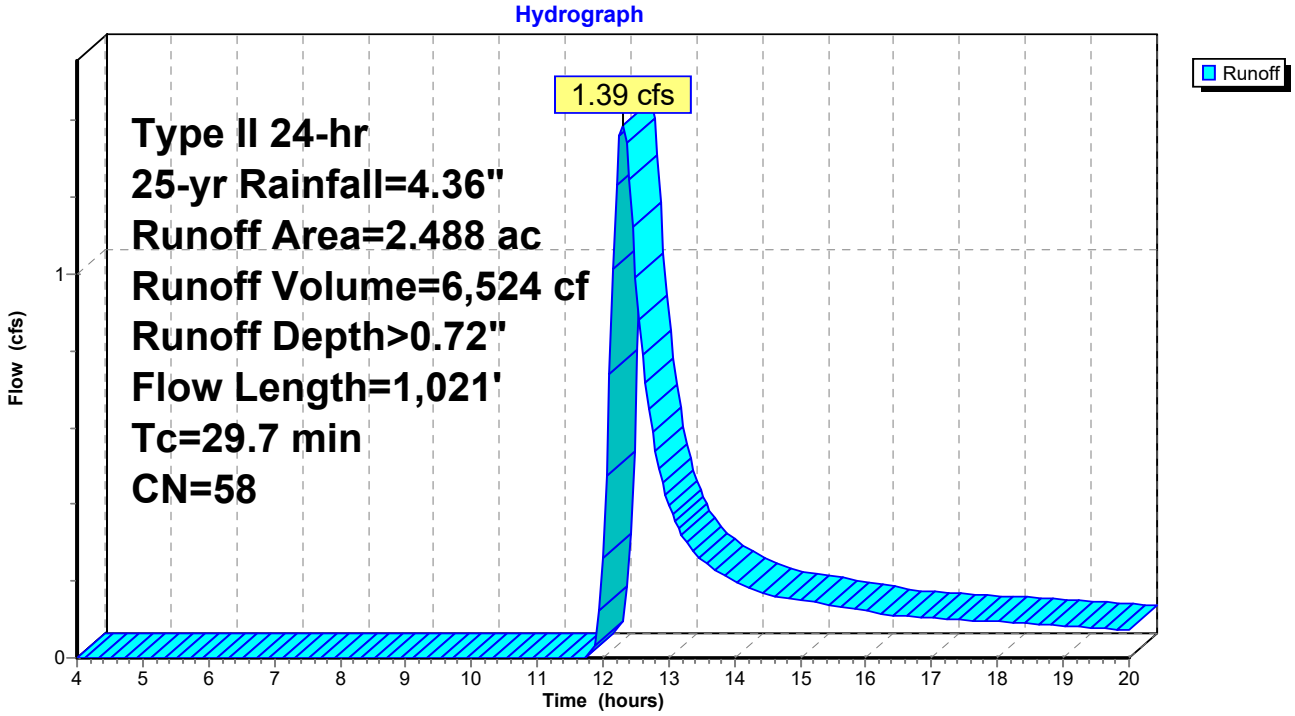
Runoff = 1.39 cfs @ 12.30 hrs, Volume= 6,524 cf, Depth> 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (ac)	CN	Description
2.040	58	Meadow, non-grazed, HSG B
0.448	60	Woods, Fair, HSG B
2.488	58	Weighted Average
2.488		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.3	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
9.4	921	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.7	1,021	Total			

Subcatchment 10S: DA-2



Hydrograph for Subcatchment 10S: DA-2

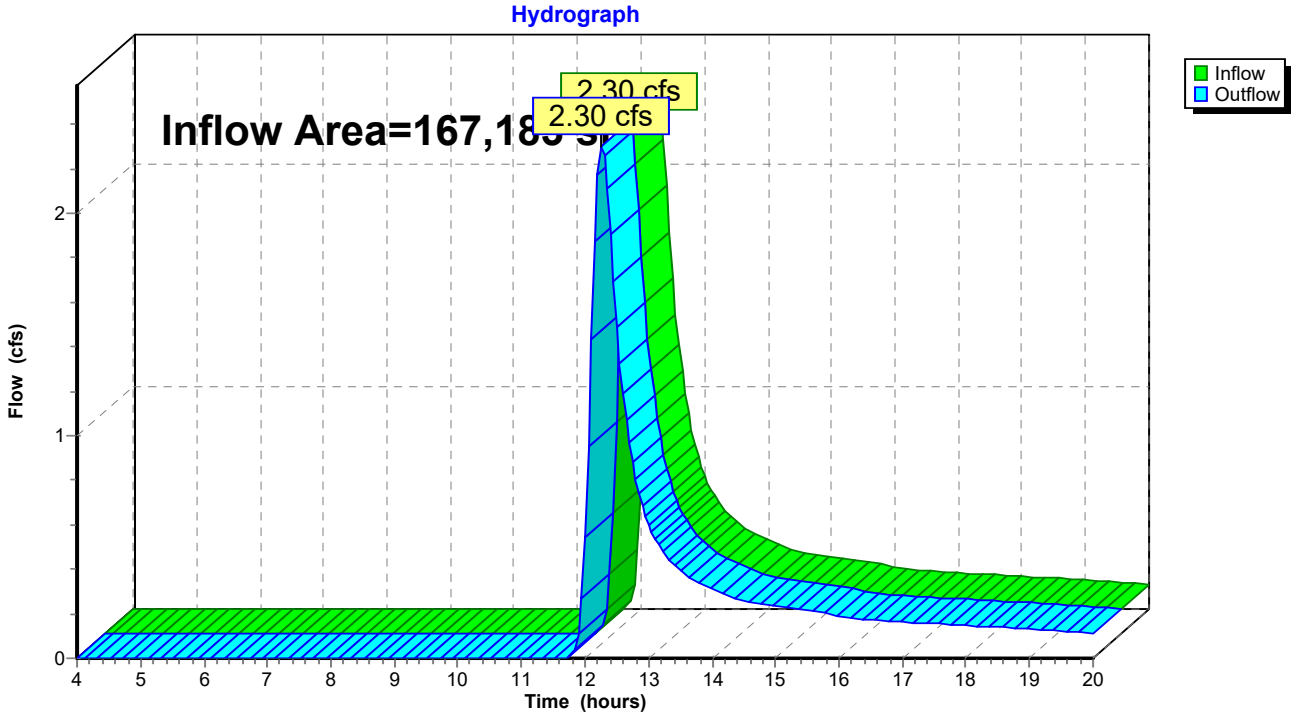
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.21	0.00	0.00
4.25	0.22	0.00	0.00
4.50	0.24	0.00	0.00
4.75	0.26	0.00	0.00
5.00	0.27	0.00	0.00
5.25	0.29	0.00	0.00
5.50	0.31	0.00	0.00
5.75	0.33	0.00	0.00
6.00	0.35	0.00	0.00
6.25	0.37	0.00	0.00
6.50	0.39	0.00	0.00
6.75	0.41	0.00	0.00
7.00	0.43	0.00	0.00
7.25	0.45	0.00	0.00
7.50	0.48	0.00	0.00
7.75	0.50	0.00	0.00
8.00	0.52	0.00	0.00
8.25	0.55	0.00	0.00
8.50	0.58	0.00	0.00
8.75	0.61	0.00	0.00
9.00	0.64	0.00	0.00
9.25	0.68	0.00	0.00
9.50	0.71	0.00	0.00
9.75	0.75	0.00	0.00
10.00	0.79	0.00	0.00
10.25	0.84	0.00	0.00
10.50	0.89	0.00	0.00
10.75	0.95	0.00	0.00
11.00	1.02	0.00	0.00
11.25	1.12	0.00	0.00
11.50	1.23	0.00	0.00
11.75	1.69	0.01	0.00
12.00	2.89	0.24	0.26
12.25	3.08	0.30	**1.36**
12.50	3.20	0.34	**0.99**
12.75	3.29	0.37	0.59
13.00	3.37	0.40	0.40
13.25	3.43	0.43	0.31
13.50	3.48	0.45	0.26
13.75	3.53	0.47	0.22
14.00	3.58	0.48	0.20
14.25	3.61	0.50	0.18
14.50	3.65	0.51	0.17
14.75	3.69	0.53	0.16
15.00	3.72	0.54	0.15
15.25	3.75	0.56	0.14
15.50	3.78	0.57	0.14
15.75	3.81	0.58	0.13
16.00	3.84	0.59	0.12
16.25	3.86	0.60	0.12
16.50	3.89	0.61	0.11
16.75	3.91	0.62	0.11
17.00	3.93	0.63	0.10
17.25	3.95	0.64	0.10
17.50	3.97	0.65	0.10
17.75	4.00	0.66	0.10
18.00	4.02	0.67	0.09
18.25	4.03	0.68	0.09
18.50	4.05	0.69	0.09
18.75	4.07	0.70	0.09
19.00	4.09	0.71	0.08
19.25	4.11	0.71	0.08
19.50	4.12	0.72	0.08
19.75	4.14	0.73	0.08
20.00	**4.15**	**0.73**	0.07

Summary for Reach 9R: Pre

Inflow Area = 167,183 sf, 0.00% Impervious, Inflow Depth > 0.74" for 25-yr event
Inflow = 2.30 cfs @ 12.26 hrs, Volume= 10,320 cf
Outflow = 2.30 cfs @ 12.26 hrs, Volume= 10,320 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 9R: Pre



Hydrograph for Reach 9R: Pre

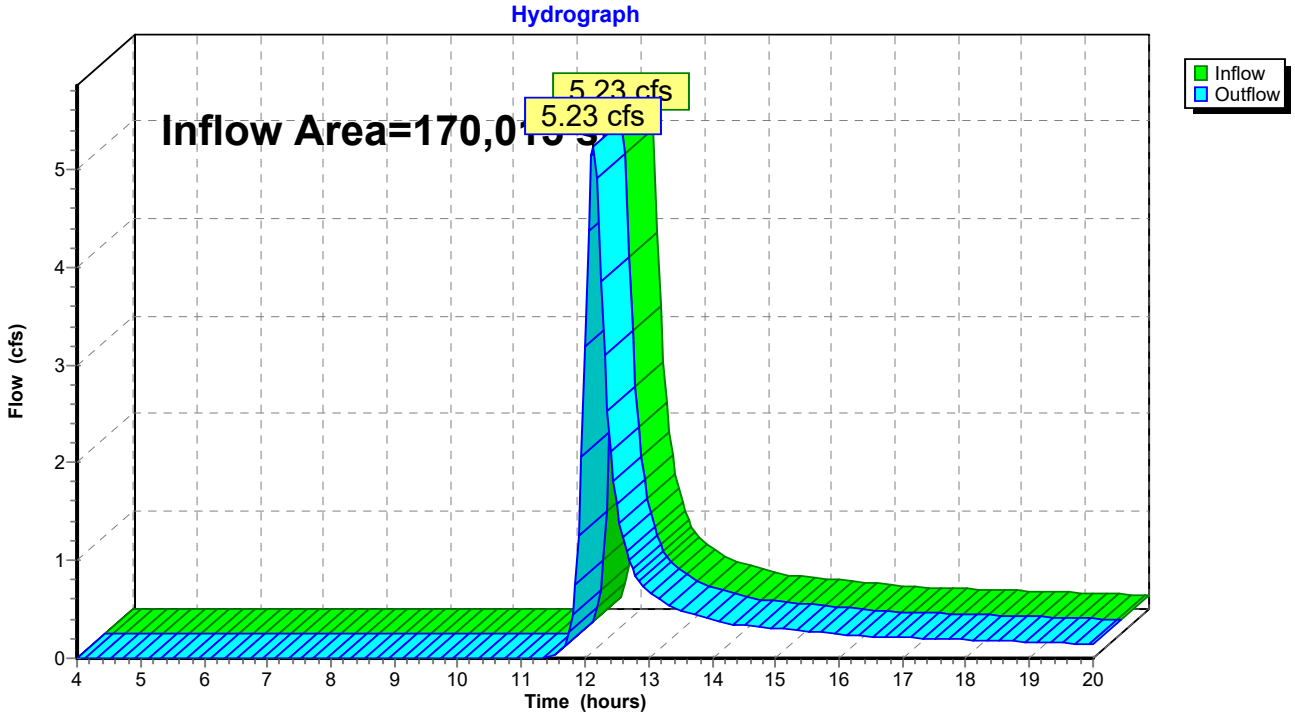
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.16		0.16
4.25	0.00		0.00	17.25	0.16		0.16
4.50	0.00		0.00	17.50	0.16		0.16
4.75	0.00		0.00	17.75	0.15		0.15
5.00	0.00		0.00	18.00	0.15		0.15
5.25	0.00		0.00	18.25	0.14		0.14
5.50	0.00		0.00	18.50	0.14		0.14
5.75	0.00		0.00	18.75	0.13		0.13
6.00	0.00		0.00	19.00	0.13		0.13
6.25	0.00		0.00	19.25	0.13		0.13
6.50	0.00		0.00	19.50	0.12		0.12
6.75	0.00		0.00	19.75	0.12		0.12
7.00	0.00		0.00	20.00	0.11		0.11
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.00		0.00				
12.00	0.55		0.55				
12.25	**2.29**		**2.29**				
12.50	1.49		1.49				
12.75	0.88		0.88				
13.00	0.60		0.60				
13.25	0.47		0.47				
13.50	0.40		0.40				
13.75	0.35		0.35				
14.00	0.31		0.31				
14.25	0.28		0.28				
14.50	0.26		0.26				
14.75	0.24		0.24				
15.00	0.23		0.23				
15.25	0.22		0.22				
15.50	0.21		0.21				
15.75	0.20		0.20				
16.00	0.19		0.19				
16.25	0.18		0.18				
16.50	0.17		0.17				
16.75	0.17		0.17				

Summary for Reach 14R: Post

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 1.14" for 25-yr event
Inflow = 5.23 cfs @ 12.13 hrs, Volume= 16,086 cf
Outflow = 5.23 cfs @ 12.13 hrs, Volume= 16,086 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post



Hydrograph for Reach 14R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.21		0.21
4.25	0.00		0.00	17.25	0.21		0.21
4.50	0.00		0.00	17.50	0.20		0.20
4.75	0.00		0.00	17.75	0.19		0.19
5.00	0.00		0.00	18.00	0.19		0.19
5.25	0.00		0.00	18.25	0.18		0.18
5.50	0.00		0.00	18.50	0.18		0.18
5.75	0.00		0.00	18.75	0.17		0.17
6.00	0.00		0.00	19.00	0.17		0.17
6.25	0.00		0.00	19.25	0.16		0.16
6.50	0.00		0.00	19.50	0.15		0.15
6.75	0.00		0.00	19.75	0.15		0.15
7.00	0.00		0.00	20.00	0.14		0.14
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.04		0.04				
11.75	0.27		0.27				
12.00	**3.18**		**3.18**				
12.25	**3.85**		**3.85**				
12.50	1.57		1.57				
12.75	0.91		0.91				
13.00	0.68		0.68				
13.25	0.57		0.57				
13.50	0.50		0.50				
13.75	0.44		0.44				
14.00	0.39		0.39				
14.25	0.36		0.36				
14.50	0.33		0.33				
14.75	0.32		0.32				
15.00	0.30		0.30				
15.25	0.29		0.29				
15.50	0.27		0.27				
15.75	0.26		0.26				
16.00	0.24		0.24				
16.25	0.23		0.23				
16.50	0.22		0.22				
16.75	0.22		0.22				

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>1.53"
Flow Length=861' Tc=20.5 min CN=66 Runoff=3.20 cfs 9,985 cf

Subcatchment 6S: DA-1 Runoff Area=1.350 ac 0.00% Impervious Runoff Depth>1.07"
Flow Length=591' Tc=24.8 min CN=59 Runoff=1.38 cfs 5,228 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>1.46"
Flow Length=471' Tc=17.4 min CN=65 Runoff=3.91 cfs 11,153 cf

Subcatchment 10S: DA-2 Runoff Area=2.488 ac 0.00% Impervious Runoff Depth>1.00"
Flow Length=1,021' Tc=29.7 min CN=58 Runoff=2.08 cfs 9,065 cf

Reach 9R: Pre Inflow=3.41 cfs 14,293 cf
Outflow=3.41 cfs 14,293 cf

Reach 14R: Post Inflow=7.05 cfs 21,138 cf
Outflow=7.05 cfs 21,138 cf

Total Runoff Area = 337,198 sf Runoff Volume = 35,432 cf Average Runoff Depth = 1.26"
100.00% Pervious = 337,198 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

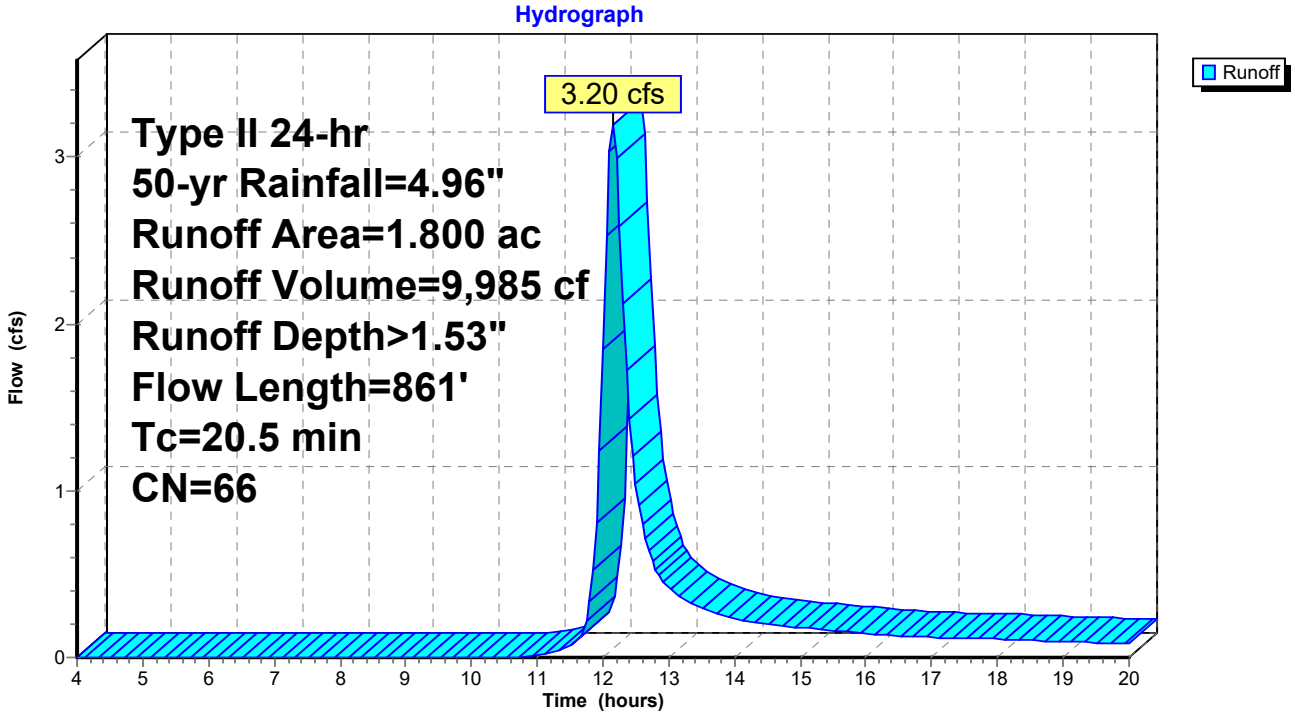
Runoff = 3.20 cfs @ 12.15 hrs, Volume= 9,985 cf, Depth> 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.24	0.00	0.00
4.25	0.26	0.00	0.00
4.50	0.27	0.00	0.00
4.75	0.29	0.00	0.00
5.00	0.31	0.00	0.00
5.25	0.33	0.00	0.00
5.50	0.35	0.00	0.00
5.75	0.37	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.42	0.00	0.00
6.50	0.44	0.00	0.00
6.75	0.47	0.00	0.00
7.00	0.49	0.00	0.00
7.25	0.52	0.00	0.00
7.50	0.54	0.00	0.00
7.75	0.57	0.00	0.00
8.00	0.60	0.00	0.00
8.25	0.62	0.00	0.00
8.50	0.66	0.00	0.00
8.75	0.69	0.00	0.00
9.00	0.73	0.00	0.00
9.25	0.77	0.00	0.00
9.50	0.81	0.00	0.00
9.75	0.85	0.00	0.00
10.00	0.90	0.00	0.00
10.25	0.95	0.00	0.00
10.50	1.01	0.00	0.00
10.75	1.08	0.00	0.00
11.00	1.17	0.00	0.01
11.25	1.27	0.01	0.03
11.50	1.40	0.03	0.07
11.75	1.92	0.13	0.22
12.00	3.29	0.69	**1.85**
12.25	3.50	0.80	**2.59**
12.50	3.65	0.88	1.04
12.75	3.75	0.94	0.58
13.00	3.83	0.99	0.41
13.25	3.90	1.03	0.34
13.50	3.96	1.06	0.30
13.75	4.02	1.10	0.26
14.00	4.07	1.13	0.23
14.25	4.11	1.15	0.21
14.50	4.15	1.18	0.20
14.75	4.20	1.20	0.19
15.00	4.23	1.23	0.18
15.25	4.27	1.25	0.17
15.50	4.30	1.27	0.16
15.75	4.34	1.29	0.15
16.00	4.36	1.31	0.14
16.25	4.39	1.33	0.13
16.50	4.42	1.35	0.13
16.75	4.45	1.36	0.13
17.00	4.47	1.38	0.12
17.25	4.50	1.39	0.12
17.50	4.52	1.41	0.12
17.75	4.55	1.43	0.11
18.00	4.57	1.44	0.11
18.25	4.59	1.45	0.11
18.50	4.61	1.47	0.10
18.75	4.63	1.48	0.10
19.00	4.65	1.49	0.10
19.25	4.67	1.51	0.09
19.50	4.69	1.52	0.09
19.75	4.71	1.53	0.09
20.00	**4.72**	**1.54**	0.08

Summary for Subcatchment 6S: DA-1

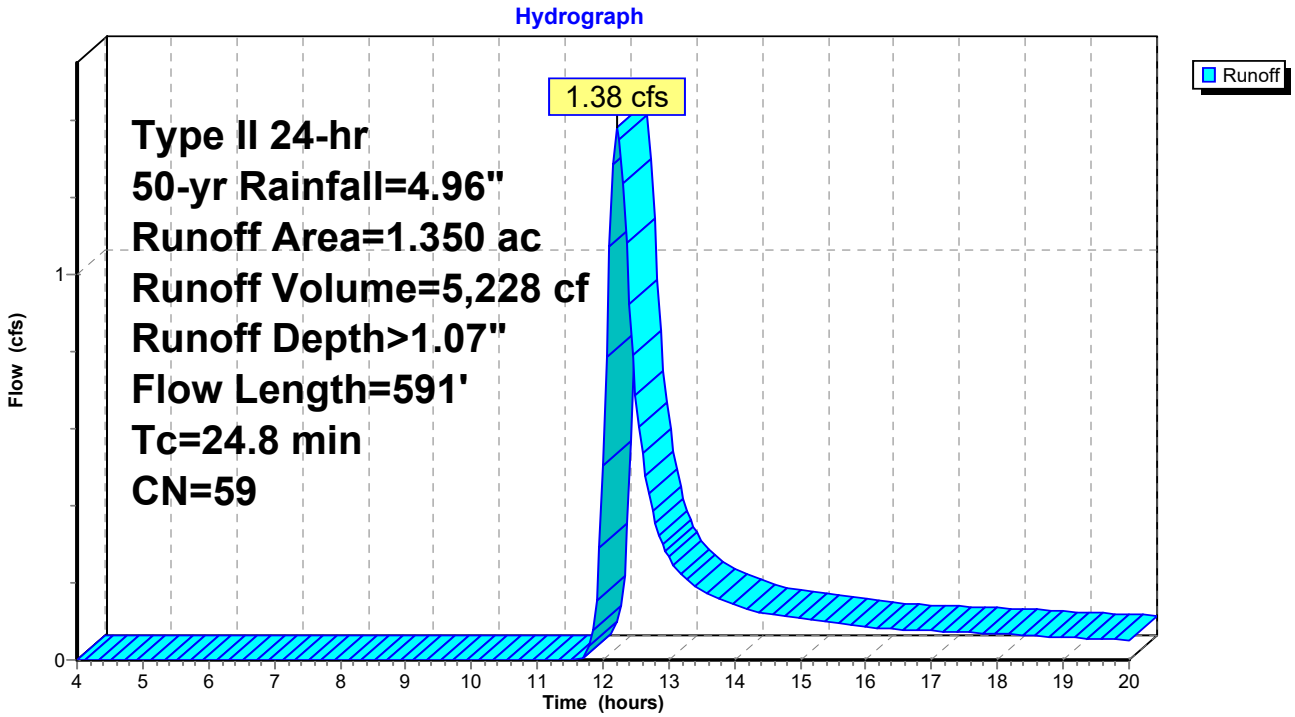
Runoff = 1.38 cfs @ 12.21 hrs, Volume= 5,228 cf, Depth> 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (ac)	CN	Description
0.992	60	Woods, Fair, HSG B
0.358	58	Meadow, non-grazed, HSG B
1.350	59	Weighted Average
1.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.1	100	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.9	143	0.1600	2.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.8	348	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	591	Total			

Subcatchment 6S: DA-1



Hydrograph for Subcatchment 6S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.24	0.00	0.00	17.00	4.47	0.95	0.07
4.25	0.26	0.00	0.00	17.25	4.50	0.96	0.07
4.50	0.27	0.00	0.00	17.50	4.52	0.97	0.07
4.75	0.29	0.00	0.00	17.75	4.55	0.99	0.07
5.00	0.31	0.00	0.00	18.00	4.57	1.00	0.07
5.25	0.33	0.00	0.00	18.25	4.59	1.01	0.07
5.50	0.35	0.00	0.00	18.50	4.61	1.02	0.06
5.75	0.37	0.00	0.00	18.75	4.63	1.03	0.06
6.00	0.40	0.00	0.00	19.00	4.65	1.04	0.06
6.25	0.42	0.00	0.00	19.25	4.67	1.05	0.06
6.50	0.44	0.00	0.00	19.50	4.69	1.06	0.06
6.75	0.47	0.00	0.00	19.75	4.71	1.07	0.05
7.00	0.49	0.00	0.00	20.00	**4.72**	**1.08**	0.05
7.25	0.52	0.00	0.00				
7.50	0.54	0.00	0.00				
7.75	0.57	0.00	0.00				
8.00	0.60	0.00	0.00				
8.25	0.62	0.00	0.00				
8.50	0.66	0.00	0.00				
8.75	0.69	0.00	0.00				
9.00	0.73	0.00	0.00				
9.25	0.77	0.00	0.00				
9.50	0.81	0.00	0.00				
9.75	0.85	0.00	0.00				
10.00	0.90	0.00	0.00				
10.25	0.95	0.00	0.00				
10.50	1.01	0.00	0.00				
10.75	1.08	0.00	0.00				
11.00	1.17	0.00	0.00				
11.25	1.27	0.00	0.00				
11.50	1.40	0.00	0.00				
11.75	1.92	0.04	0.01				
12.00	3.29	0.41	**0.51**				
12.25	3.50	0.49	**1.35**				
12.50	3.65	0.55	0.69				
12.75	3.75	0.60	0.39				
13.00	3.83	0.63	0.27				
13.25	3.90	0.67	0.21				
13.50	3.96	0.70	0.18				
13.75	4.02	0.72	0.16				
14.00	4.07	0.74	0.14				
14.25	4.11	0.77	0.13				
14.50	4.15	0.79	0.12				
14.75	4.20	0.81	0.11				
15.00	4.23	0.83	0.11				
15.25	4.27	0.84	0.10				
15.50	4.30	0.86	0.10				
15.75	4.34	0.88	0.09				
16.00	4.36	0.89	0.09				
16.25	4.39	0.91	0.08				
16.50	4.42	0.92	0.08				
16.75	4.45	0.93	0.08				

Summary for Subcatchment 7S: DA-2

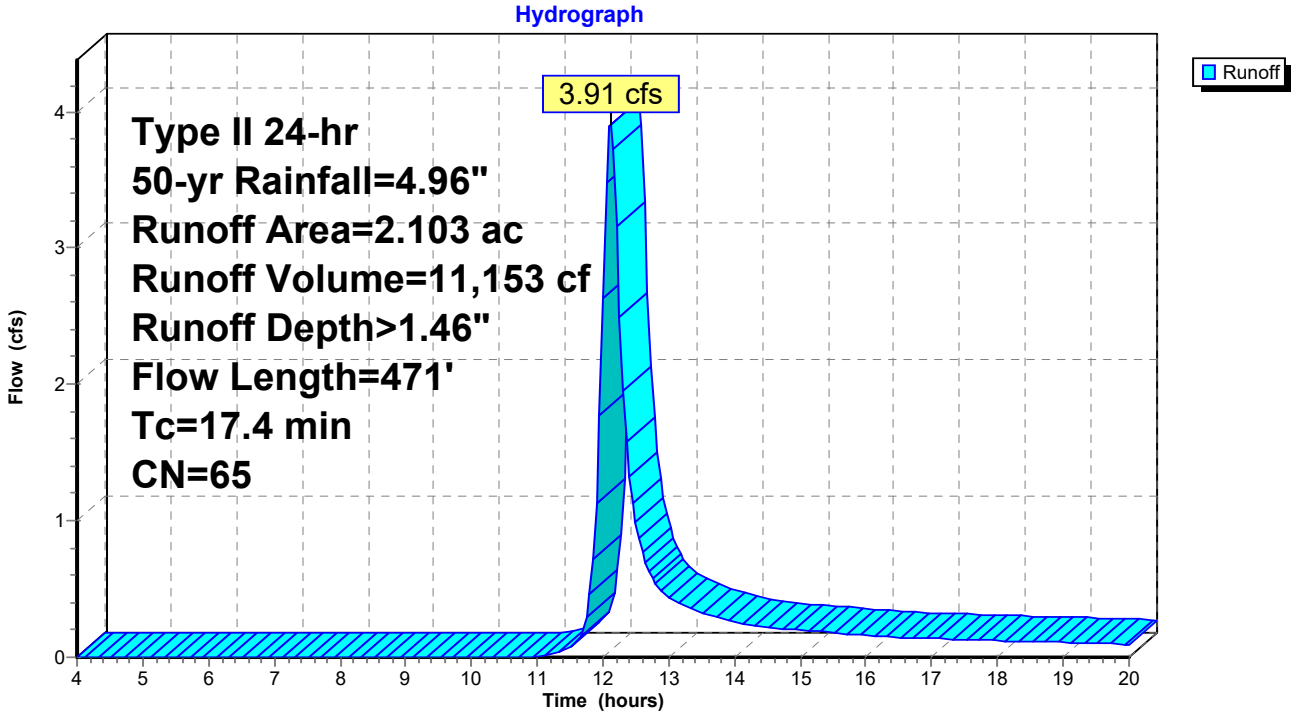
Runoff = 3.91 cfs @ 12.11 hrs, Volume= 11,153 cf, Depth> 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.24	0.00	0.00
4.25	0.26	0.00	0.00
4.50	0.27	0.00	0.00
4.75	0.29	0.00	0.00
5.00	0.31	0.00	0.00
5.25	0.33	0.00	0.00
5.50	0.35	0.00	0.00
5.75	0.37	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.42	0.00	0.00
6.50	0.44	0.00	0.00
6.75	0.47	0.00	0.00
7.00	0.49	0.00	0.00
7.25	0.52	0.00	0.00
7.50	0.54	0.00	0.00
7.75	0.57	0.00	0.00
8.00	0.60	0.00	0.00
8.25	0.62	0.00	0.00
8.50	0.66	0.00	0.00
8.75	0.69	0.00	0.00
9.00	0.73	0.00	0.00
9.25	0.77	0.00	0.00
9.50	0.81	0.00	0.00
9.75	0.85	0.00	0.00
10.00	0.90	0.00	0.00
10.25	0.95	0.00	0.00
10.50	1.01	0.00	0.00
10.75	1.08	0.00	0.00
11.00	1.17	0.00	0.00
11.25	1.27	0.01	0.03
11.50	1.40	0.02	0.07
11.75	1.92	0.11	0.29
12.00	3.29	0.64	**2.64**
12.25	3.50	0.75	**2.49**
12.50	3.65	0.83	0.98
12.75	3.75	0.88	0.58
13.00	3.83	0.93	0.44
13.25	3.90	0.97	0.37
13.50	3.96	1.01	0.33
13.75	4.02	1.04	0.29
14.00	4.07	1.07	0.26
14.25	4.11	1.09	0.23
14.50	4.15	1.12	0.22
14.75	4.20	1.14	0.21
15.00	4.23	1.17	0.20
15.25	4.27	1.19	0.19
15.50	4.30	1.21	0.18
15.75	4.34	1.23	0.17
16.00	4.36	1.25	0.16
16.25	4.39	1.26	0.15
16.50	4.42	1.28	0.15
16.75	4.45	1.30	0.14
17.00	4.47	1.31	0.14
17.25	4.50	1.33	0.13
17.50	4.52	1.34	0.13
17.75	4.55	1.36	0.13
18.00	4.57	1.37	0.12
18.25	4.59	1.39	0.12
18.50	4.61	1.40	0.12
18.75	4.63	1.41	0.11
19.00	4.65	1.43	0.11
19.25	4.67	1.44	0.10
19.50	4.69	1.45	0.10
19.75	4.71	1.46	0.10
20.00	**4.72**	**1.47**	0.09

Summary for Subcatchment 10S: DA-2

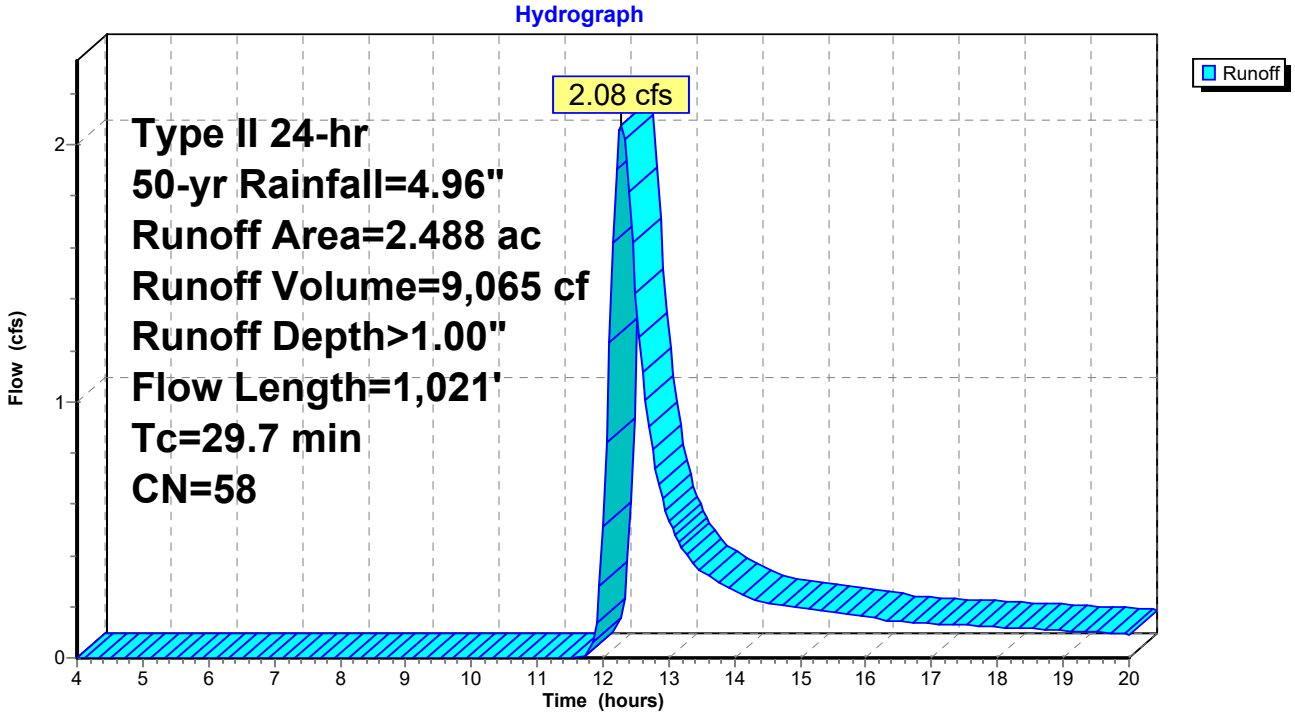
Runoff = 2.08 cfs @ 12.28 hrs, Volume= 9,065 cf, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (ac)	CN	Description
2.040	58	Meadow, non-grazed, HSG B
0.448	60	Woods, Fair, HSG B
2.488	58	Weighted Average
2.488		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.3	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
9.4	921	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.7	1,021	Total			

Subcatchment 10S: DA-2



Hydrograph for Subcatchment 10S: DA-2

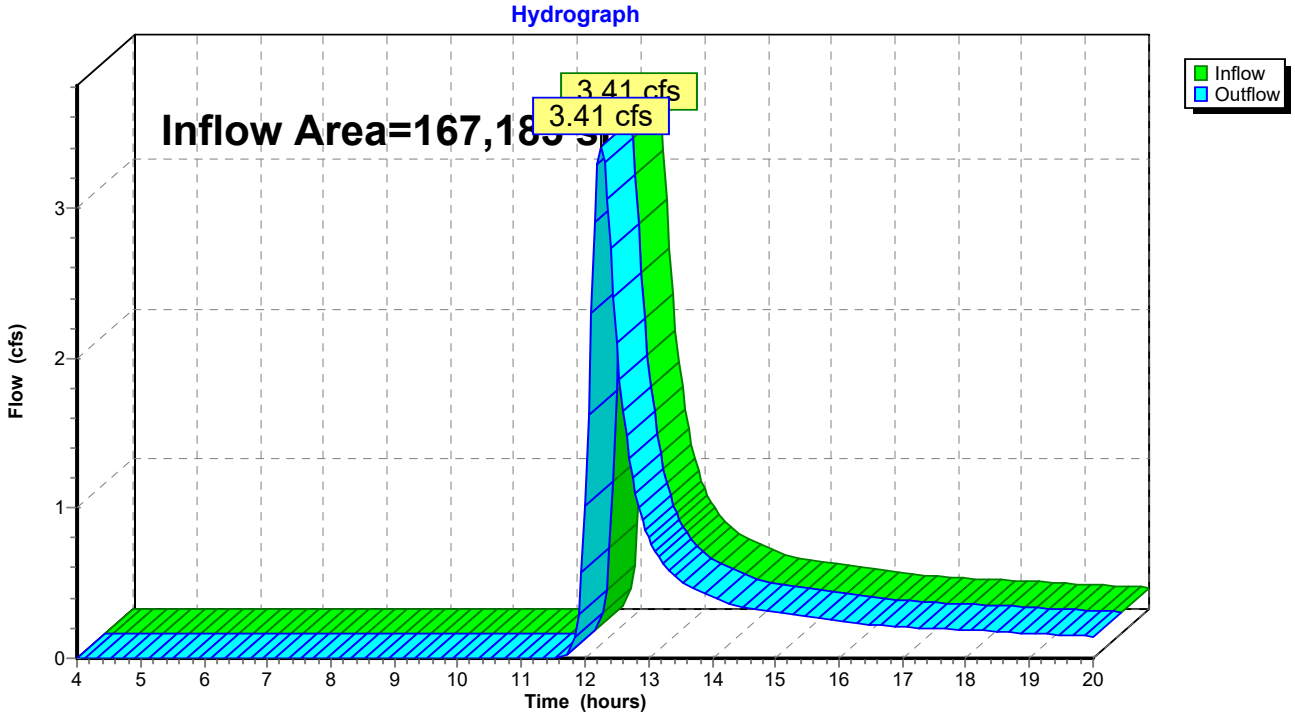
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.24	0.00	0.00	17.00	4.47	0.89	0.13
4.25	0.26	0.00	0.00	17.25	4.50	0.90	0.13
4.50	0.27	0.00	0.00	17.50	4.52	0.92	0.13
4.75	0.29	0.00	0.00	17.75	4.55	0.93	0.12
5.00	0.31	0.00	0.00	18.00	4.57	0.94	0.12
5.25	0.33	0.00	0.00	18.25	4.59	0.95	0.12
5.50	0.35	0.00	0.00	18.50	4.61	0.96	0.11
5.75	0.37	0.00	0.00	18.75	4.63	0.97	0.11
6.00	0.40	0.00	0.00	19.00	4.65	0.98	0.11
6.25	0.42	0.00	0.00	19.25	4.67	0.99	0.10
6.50	0.44	0.00	0.00	19.50	4.69	1.00	0.10
6.75	0.47	0.00	0.00	19.75	4.71	1.01	0.10
7.00	0.49	0.00	0.00	20.00	**4.72**	**1.02**	0.09
7.25	0.52	0.00	0.00				
7.50	0.54	0.00	0.00				
7.75	0.57	0.00	0.00				
8.00	0.60	0.00	0.00				
8.25	0.62	0.00	0.00				
8.50	0.66	0.00	0.00				
8.75	0.69	0.00	0.00				
9.00	0.73	0.00	0.00				
9.25	0.77	0.00	0.00				
9.50	0.81	0.00	0.00				
9.75	0.85	0.00	0.00				
10.00	0.90	0.00	0.00				
10.25	0.95	0.00	0.00				
10.50	1.01	0.00	0.00				
10.75	1.08	0.00	0.00				
11.00	1.17	0.00	0.00				
11.25	1.27	0.00	0.00				
11.50	1.40	0.00	0.00				
11.75	1.92	0.03	0.01				
12.00	3.29	0.37	0.51				
12.25	3.50	0.45	**2.06**				
12.50	3.65	0.51	**1.42**				
12.75	3.75	0.55	0.81				
13.00	3.83	0.59	0.54				
13.25	3.90	0.62	0.41				
13.50	3.96	0.65	0.34				
13.75	4.02	0.67	0.29				
14.00	4.07	0.70	0.26				
14.25	4.11	0.72	0.23				
14.50	4.15	0.74	0.22				
14.75	4.20	0.76	0.20				
15.00	4.23	0.77	0.19				
15.25	4.27	0.79	0.19				
15.50	4.30	0.81	0.18				
15.75	4.34	0.82	0.17				
16.00	4.36	0.84	0.16				
16.25	4.39	0.85	0.15				
16.50	4.42	0.86	0.14				
16.75	4.45	0.88	0.14				

Summary for Reach 9R: Pre

Inflow Area = 167,183 sf, 0.00% Impervious, Inflow Depth > 1.03" for 50-yr event
Inflow = 3.41 cfs @ 12.25 hrs, Volume= 14,293 cf
Outflow = 3.41 cfs @ 12.25 hrs, Volume= 14,293 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 9R: Pre



Hydrograph for Reach 9R: Pre

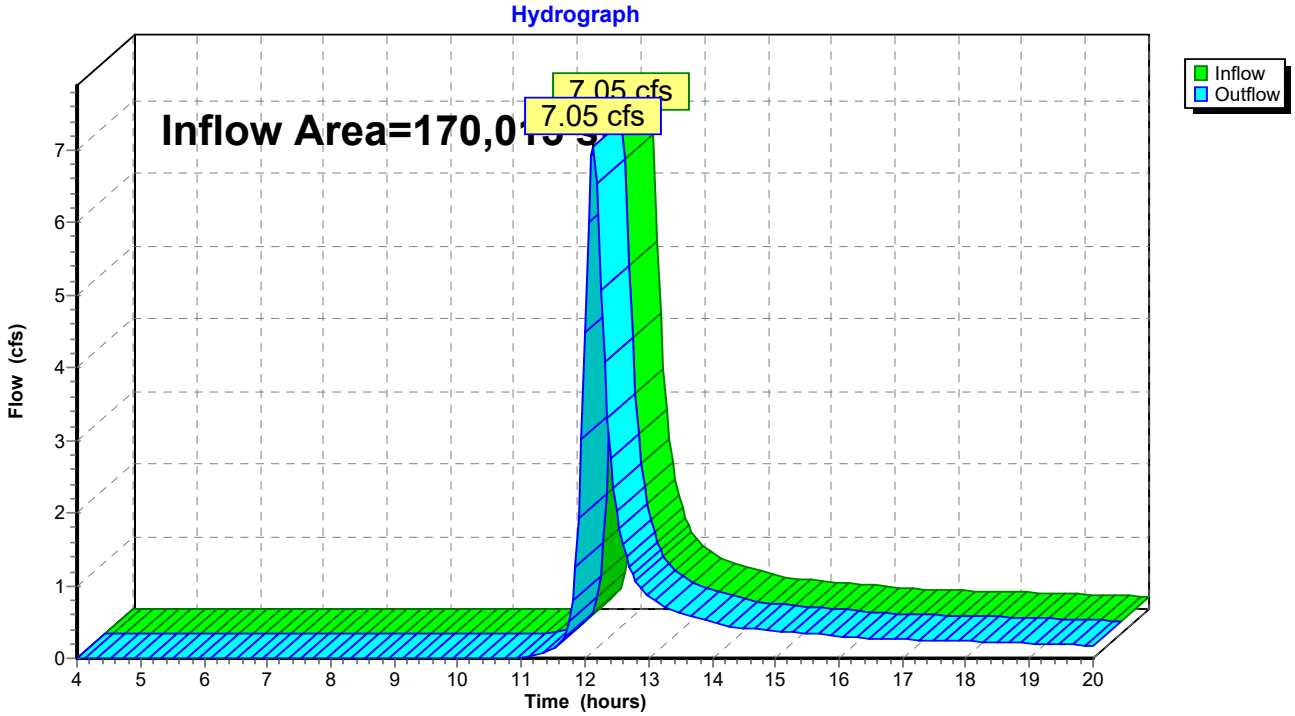
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.21		0.21
4.25	0.00		0.00	17.25	0.20		0.20
4.50	0.00		0.00	17.50	0.20		0.20
4.75	0.00		0.00	17.75	0.19		0.19
5.00	0.00		0.00	18.00	0.19		0.19
5.25	0.00		0.00	18.25	0.18		0.18
5.50	0.00		0.00	18.50	0.18		0.18
5.75	0.00		0.00	18.75	0.17		0.17
6.00	0.00		0.00	19.00	0.17		0.17
6.25	0.00		0.00	19.25	0.16		0.16
6.50	0.00		0.00	19.50	0.15		0.15
6.75	0.00		0.00	19.75	0.15		0.15
7.00	0.00		0.00	20.00	0.14		0.14
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.02		0.02				
12.00	1.02		1.02				
12.25	**3.41**		**3.41**				
12.50	2.10		2.10				
12.75	1.20		1.20				
13.00	0.80		0.80				
13.25	0.62		0.62				
13.50	0.52		0.52				
13.75	0.45		0.45				
14.00	0.40		0.40				
14.25	0.36		0.36				
14.50	0.33		0.33				
14.75	0.32		0.32				
15.00	0.30		0.30				
15.25	0.29		0.29				
15.50	0.28		0.28				
15.75	0.26		0.26				
16.00	0.25		0.25				
16.25	0.23		0.23				
16.50	0.22		0.22				
16.75	0.21		0.21				

Summary for Reach 14R: Post

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 1.49" for 50-yr event
Inflow = 7.05 cfs @ 12.12 hrs, Volume= 21,138 cf
Outflow = 7.05 cfs @ 12.12 hrs, Volume= 21,138 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post



Hydrograph for Reach 14R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.26		0.26
4.25	0.00		0.00	17.25	0.25		0.25
4.50	0.00		0.00	17.50	0.25		0.25
4.75	0.00		0.00	17.75	0.24		0.24
5.00	0.00		0.00	18.00	0.23		0.23
5.25	0.00		0.00	18.25	0.23		0.23
5.50	0.00		0.00	18.50	0.22		0.22
5.75	0.00		0.00	18.75	0.21		0.21
6.00	0.00		0.00	19.00	0.20		0.20
6.25	0.00		0.00	19.25	0.20		0.20
6.50	0.00		0.00	19.50	0.19		0.19
6.75	0.00		0.00	19.75	0.18		0.18
7.00	0.00		0.00	20.00	0.17		0.17
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.01		0.01				
11.25	0.05		0.05				
11.50	0.13		0.13				
11.75	0.51		0.51				
12.00	**4.49**		**4.49**				
12.25	**5.08**		**5.08**				
12.50	2.03		2.03				
12.75	1.15		1.15				
13.00	0.86		0.86				
13.25	0.71		0.71				
13.50	0.62		0.62				
13.75	0.55		0.55				
14.00	0.49		0.49				
14.25	0.44		0.44				
14.50	0.42		0.42				
14.75	0.40		0.40				
15.00	0.38		0.38				
15.25	0.36		0.36				
15.50	0.34		0.34				
15.75	0.32		0.32				
16.00	0.30		0.30				
16.25	0.28		0.28				
16.50	0.27		0.27				
16.75	0.27		0.27				

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>1.95"
Flow Length=861' Tc=20.5 min CN=66 Runoff=4.12 cfs 12,729 cf

Subcatchment 6S: DA-1 Runoff Area=1.350 ac 0.00% Impervious Runoff Depth>1.42"
Flow Length=591' Tc=24.8 min CN=59 Runoff=1.91 cfs 6,939 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>1.87"
Flow Length=471' Tc=17.4 min CN=65 Runoff=5.07 cfs 14,288 cf

Subcatchment 10S: DA-2 Runoff Area=2.488 ac 0.00% Impervious Runoff Depth>1.34"
Flow Length=1,021' Tc=29.7 min CN=58 Runoff=2.92 cfs 12,117 cf

Reach 9R: Pre Inflow=4.75 cfs 19,056 cf
Outflow=4.75 cfs 19,056 cf

Reach 14R: Post Inflow=9.12 cfs 27,017 cf
Outflow=9.12 cfs 27,017 cf

Total Runoff Area = 337,198 sf Runoff Volume = 46,073 cf Average Runoff Depth = 1.64"
100.00% Pervious = 337,198 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

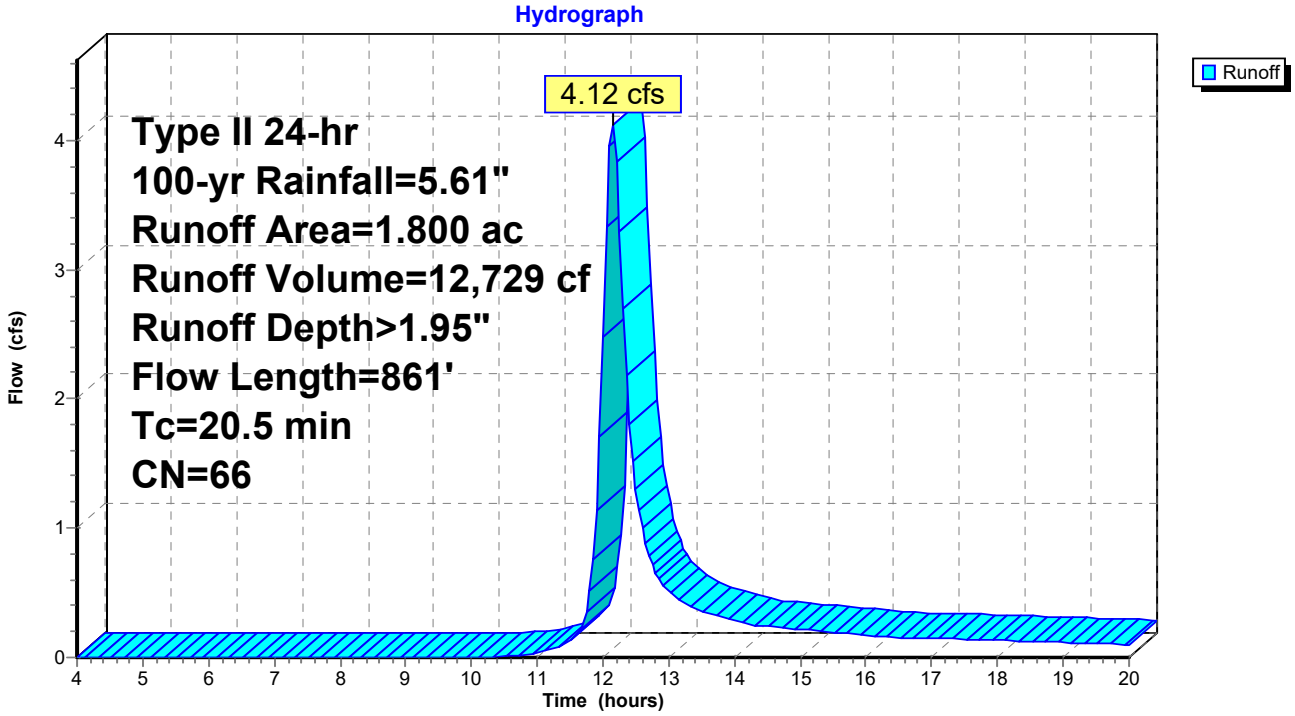
Runoff = 4.12 cfs @ 12.14 hrs, Volume= 12,729 cf, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.27	0.00	0.00
4.25	0.29	0.00	0.00
4.50	0.31	0.00	0.00
4.75	0.33	0.00	0.00
5.00	0.35	0.00	0.00
5.25	0.38	0.00	0.00
5.50	0.40	0.00	0.00
5.75	0.42	0.00	0.00
6.00	0.45	0.00	0.00
6.25	0.47	0.00	0.00
6.50	0.50	0.00	0.00
6.75	0.53	0.00	0.00
7.00	0.56	0.00	0.00
7.25	0.58	0.00	0.00
7.50	0.61	0.00	0.00
7.75	0.64	0.00	0.00
8.00	0.67	0.00	0.00
8.25	0.71	0.00	0.00
8.50	0.74	0.00	0.00
8.75	0.78	0.00	0.00
9.00	0.82	0.00	0.00
9.25	0.87	0.00	0.00
9.50	0.91	0.00	0.00
9.75	0.96	0.00	0.00
10.00	1.02	0.00	0.00
10.25	1.08	0.00	0.00
10.50	1.14	0.00	0.01
10.75	1.22	0.01	0.02
11.00	1.32	0.02	0.04
11.25	1.44	0.03	0.07
11.50	1.59	0.05	0.12
11.75	2.17	0.21	0.35
12.00	3.72	0.92	**2.48**
12.25	3.96	1.06	**3.30**
12.50	4.12	1.16	1.31
12.75	4.24	1.23	0.72
13.00	4.33	1.29	0.51
13.25	4.41	1.34	0.42
13.50	4.48	1.39	0.36
13.75	4.54	1.43	0.32
14.00	4.60	1.46	0.29
14.25	4.65	1.49	0.26
14.50	4.70	1.53	0.24
14.75	4.74	1.56	0.23
15.00	4.79	1.58	0.22
15.25	4.83	1.61	0.21
15.50	4.87	1.64	0.20
15.75	4.90	1.66	0.18
16.00	4.94	1.68	0.17
16.25	4.97	1.71	0.16
16.50	5.00	1.73	0.16
16.75	5.03	1.75	0.15
17.00	5.06	1.77	0.15
17.25	5.09	1.79	0.14
17.50	5.11	1.81	0.14
17.75	5.14	1.82	0.14
18.00	5.17	1.84	0.13
18.25	5.19	1.86	0.13
18.50	5.22	1.88	0.12
18.75	5.24	1.89	0.12
19.00	5.26	1.91	0.12
19.25	5.28	1.92	0.11
19.50	5.30	1.94	0.11
19.75	5.32	1.95	0.10
20.00	**5.34**	**1.96**	0.10

Summary for Subcatchment 6S: DA-1

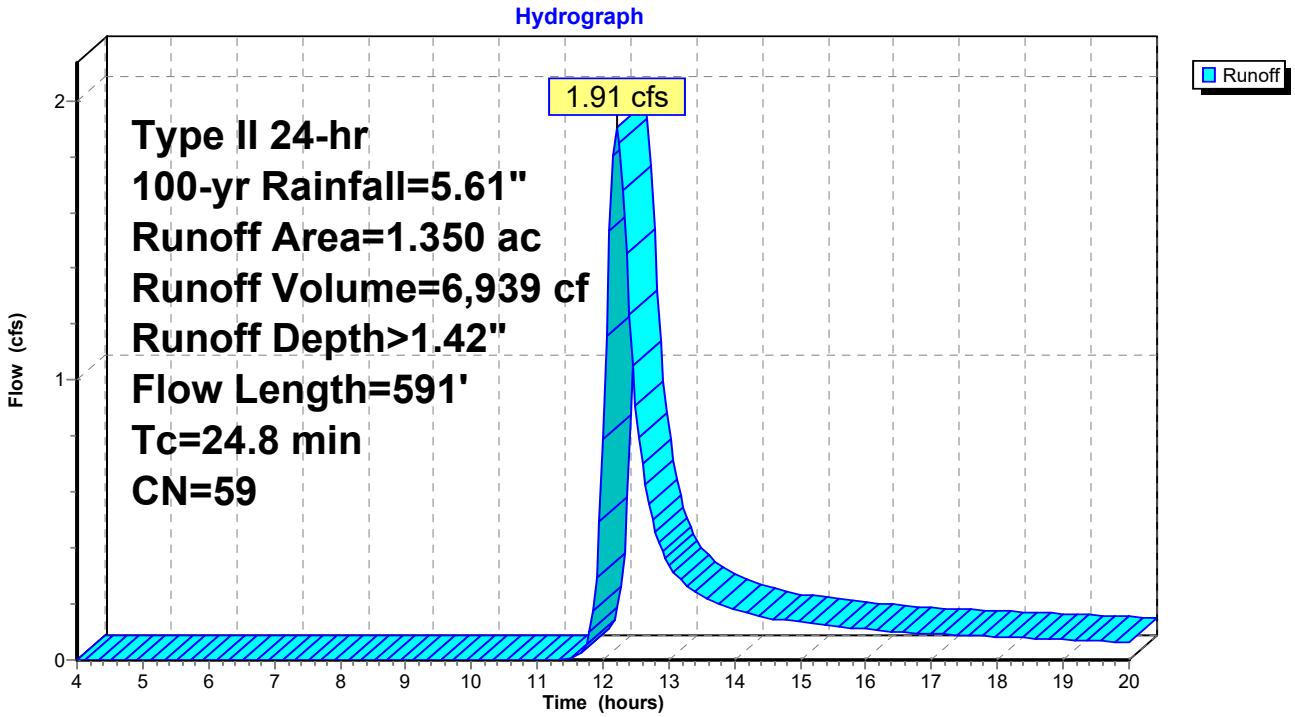
Runoff = 1.91 cfs @ 12.21 hrs, Volume= 6,939 cf, Depth> 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (ac)	CN	Description
0.992	60	Woods, Fair, HSG B
0.358	58	Meadow, non-grazed, HSG B
1.350	59	Weighted Average
1.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.1	100	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.9	143	0.1600	2.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.8	348	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	591	Total			

Subcatchment 6S: DA-1



Hydrograph for Subcatchment 6S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.27	0.00	0.00	17.00	5.06	1.27	0.09
4.25	0.29	0.00	0.00	17.25	5.09	1.28	0.09
4.50	0.31	0.00	0.00	17.50	5.11	1.30	0.09
4.75	0.33	0.00	0.00	17.75	5.14	1.32	0.09
5.00	0.35	0.00	0.00	18.00	5.17	1.33	0.08
5.25	0.38	0.00	0.00	18.25	5.19	1.34	0.08
5.50	0.40	0.00	0.00	18.50	5.22	1.36	0.08
5.75	0.42	0.00	0.00	18.75	5.24	1.37	0.08
6.00	0.45	0.00	0.00	19.00	5.26	1.38	0.07
6.25	0.47	0.00	0.00	19.25	5.28	1.40	0.07
6.50	0.50	0.00	0.00	19.50	5.30	1.41	0.07
6.75	0.53	0.00	0.00	19.75	5.32	1.42	0.07
7.00	0.56	0.00	0.00	20.00	**5.34**	**1.43**	0.06
7.25	0.58	0.00	0.00				
7.50	0.61	0.00	0.00				
7.75	0.64	0.00	0.00				
8.00	0.67	0.00	0.00				
8.25	0.71	0.00	0.00				
8.50	0.74	0.00	0.00				
8.75	0.78	0.00	0.00				
9.00	0.82	0.00	0.00				
9.25	0.87	0.00	0.00				
9.50	0.91	0.00	0.00				
9.75	0.96	0.00	0.00				
10.00	1.02	0.00	0.00				
10.25	1.08	0.00	0.00				
10.50	1.14	0.00	0.00				
10.75	1.22	0.00	0.00				
11.00	1.32	0.00	0.00				
11.25	1.44	0.00	0.00				
11.50	1.59	0.01	0.01				
11.75	2.17	0.08	0.06				
12.00	3.72	0.58	**0.79**				
12.25	3.96	0.69	**1.85**				
12.50	4.12	0.77	0.91				
12.75	4.24	0.83	0.50				
13.00	4.33	0.87	0.34				
13.25	4.41	0.92	0.27				
13.50	4.48	0.95	0.23				
13.75	4.54	0.99	0.20				
14.00	4.60	1.01	0.18				
14.25	4.65	1.04	0.16				
14.50	4.70	1.07	0.15				
14.75	4.74	1.09	0.14				
15.00	4.79	1.12	0.14				
15.25	4.83	1.14	0.13				
15.50	4.87	1.16	0.12				
15.75	4.90	1.18	0.12				
16.00	4.94	1.20	0.11				
16.25	4.97	1.22	0.10				
16.50	5.00	1.23	0.10				
16.75	5.03	1.25	0.10				

Summary for Subcatchment 7S: DA-2

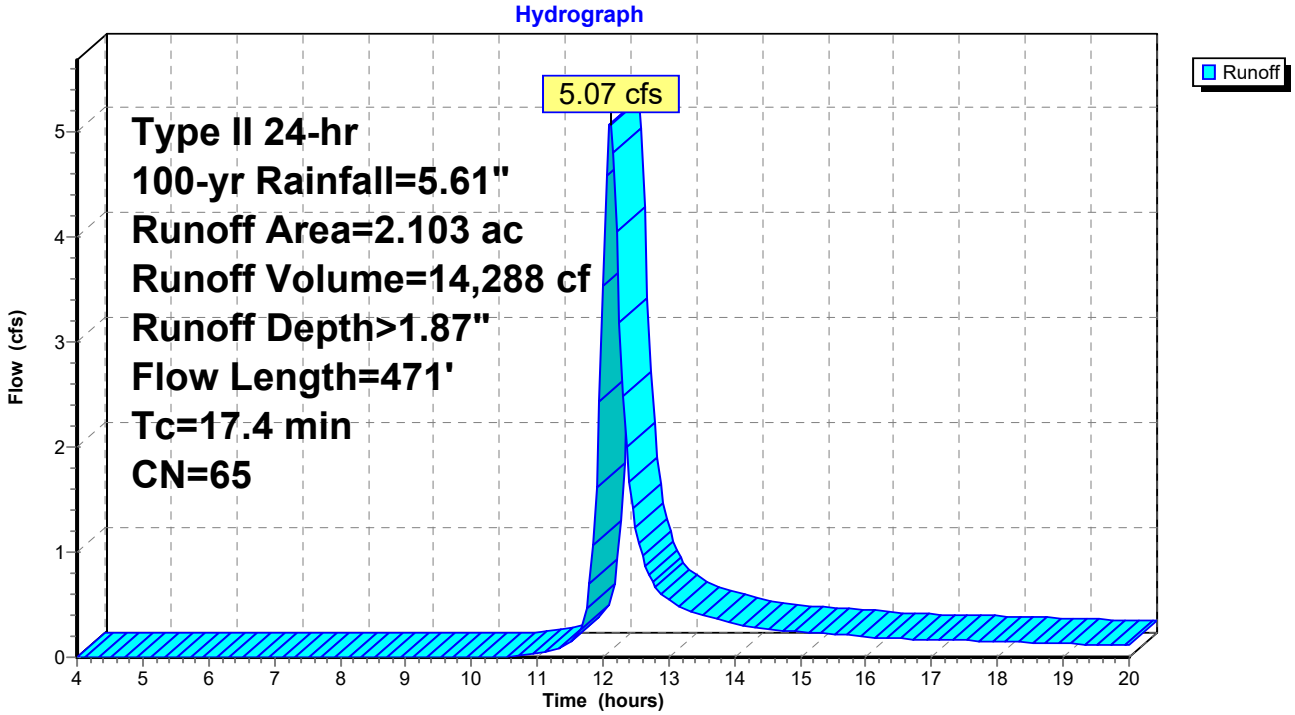
Runoff = 5.07 cfs @ 12.11 hrs, Volume= 14,288 cf, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.27	0.00	0.00	17.00	5.06	1.69	0.17
4.25	0.29	0.00	0.00	17.25	5.09	1.71	0.16
4.50	0.31	0.00	0.00	17.50	5.11	1.73	0.16
4.75	0.33	0.00	0.00	17.75	5.14	1.75	0.15
5.00	0.35	0.00	0.00	18.00	5.17	1.77	0.15
5.25	0.38	0.00	0.00	18.25	5.19	1.78	0.15
5.50	0.40	0.00	0.00	18.50	5.22	1.80	0.14
5.75	0.42	0.00	0.00	18.75	5.24	1.81	0.14
6.00	0.45	0.00	0.00	19.00	5.26	1.83	0.13
6.25	0.47	0.00	0.00	19.25	5.28	1.84	0.13
6.50	0.50	0.00	0.00	19.50	5.30	1.86	0.12
6.75	0.53	0.00	0.00	19.75	5.32	1.87	0.12
7.00	0.56	0.00	0.00	20.00	**5.34**	**1.88**	0.11
7.25	0.58	0.00	0.00				
7.50	0.61	0.00	0.00				
7.75	0.64	0.00	0.00				
8.00	0.67	0.00	0.00				
8.25	0.71	0.00	0.00				
8.50	0.74	0.00	0.00				
8.75	0.78	0.00	0.00				
9.00	0.82	0.00	0.00				
9.25	0.87	0.00	0.00				
9.50	0.91	0.00	0.00				
9.75	0.96	0.00	0.00				
10.00	1.02	0.00	0.00				
10.25	1.08	0.00	0.00				
10.50	1.14	0.00	0.00				
10.75	1.22	0.00	0.02				
11.00	1.32	0.01	0.04				
11.25	1.44	0.02	0.07				
11.50	1.59	0.04	0.14				
11.75	2.17	0.18	0.46				
12.00	3.72	0.87	**3.53**				
12.25	3.96	1.01	**3.18**				
12.50	4.12	1.10	1.23				
12.75	4.24	1.17	0.71				
13.00	4.33	1.23	0.54				
13.25	4.41	1.28	0.46				
13.50	4.48	1.32	0.40				
13.75	4.54	1.36	0.36				
14.00	4.60	1.39	0.32				
14.25	4.65	1.43	0.29				
14.50	4.70	1.46	0.27				
14.75	4.74	1.49	0.26				
15.00	4.79	1.51	0.24				
15.25	4.83	1.54	0.23				
15.50	4.87	1.57	0.22				
15.75	4.90	1.59	0.21				
16.00	4.94	1.61	0.19				
16.25	4.97	1.63	0.18				
16.50	5.00	1.65	0.18				
16.75	5.03	1.67	0.17				

Summary for Subcatchment 10S: DA-2

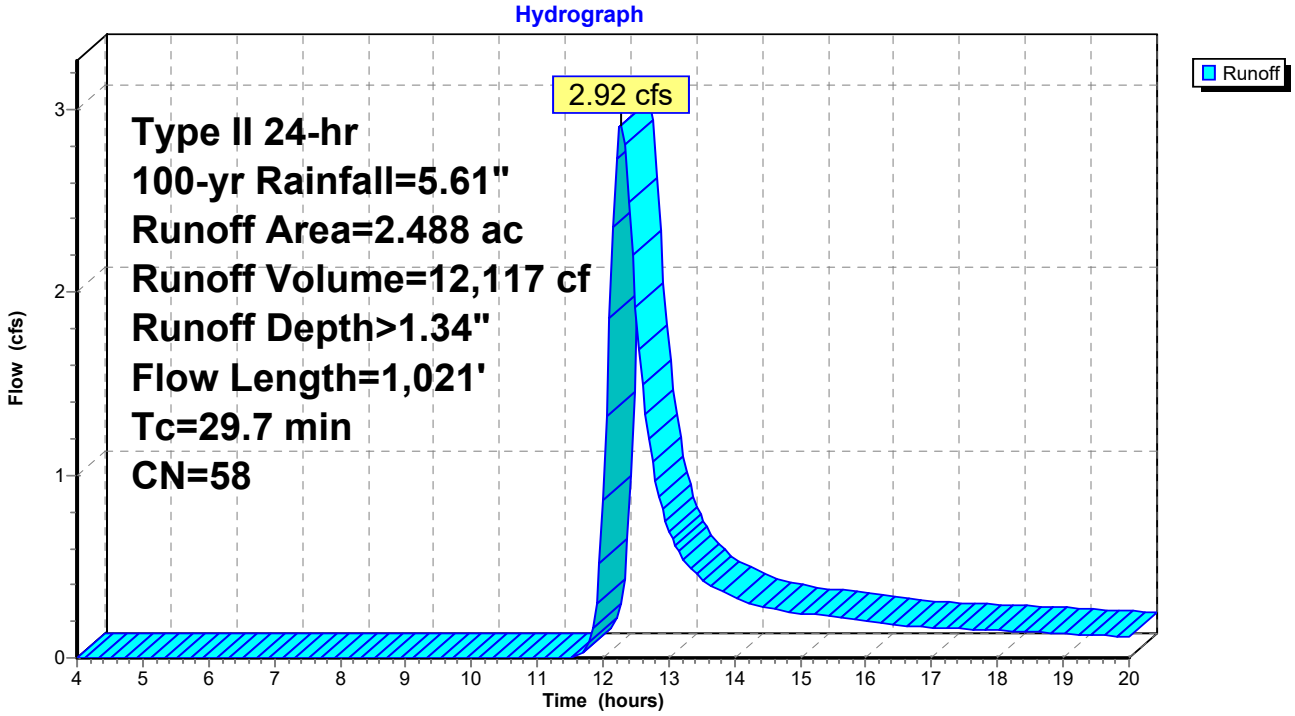
Runoff = 2.92 cfs @ 12.27 hrs, Volume= 12,117 cf, Depth> 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (ac)	CN	Description
2.040	58	Meadow, non-grazed, HSG B
0.448	60	Woods, Fair, HSG B
2.488	58	Weighted Average
2.488		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.3	100	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
9.4	921	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.7	1,021	Total			

Subcatchment 10S: DA-2



Hydrograph for Subcatchment 10S: DA-2

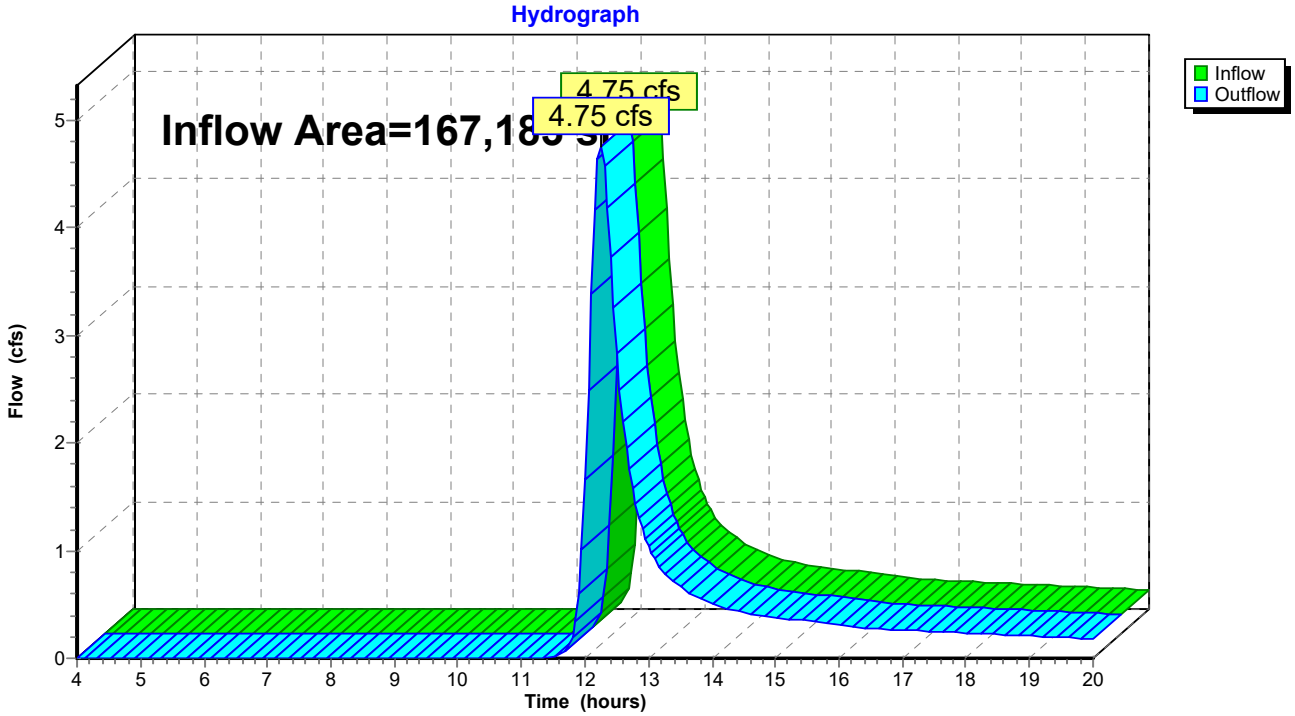
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.27	0.00	0.00	17.00	5.06	1.20	0.17
4.25	0.29	0.00	0.00	17.25	5.09	1.22	0.16
4.50	0.31	0.00	0.00	17.50	5.11	1.23	0.16
4.75	0.33	0.00	0.00	17.75	5.14	1.25	0.16
5.00	0.35	0.00	0.00	18.00	5.17	1.26	0.15
5.25	0.38	0.00	0.00	18.25	5.19	1.28	0.15
5.50	0.40	0.00	0.00	18.50	5.22	1.29	0.14
5.75	0.42	0.00	0.00	18.75	5.24	1.30	0.14
6.00	0.45	0.00	0.00	19.00	5.26	1.31	0.13
6.25	0.47	0.00	0.00	19.25	5.28	1.33	0.13
6.50	0.50	0.00	0.00	19.50	5.30	1.34	0.12
6.75	0.53	0.00	0.00	19.75	5.32	1.35	0.12
7.00	0.56	0.00	0.00	20.00	**5.34**	**1.36**	0.11
7.25	0.58	0.00	0.00				
7.50	0.61	0.00	0.00				
7.75	0.64	0.00	0.00				
8.00	0.67	0.00	0.00				
8.25	0.71	0.00	0.00				
8.50	0.74	0.00	0.00				
8.75	0.78	0.00	0.00				
9.00	0.82	0.00	0.00				
9.25	0.87	0.00	0.00				
9.50	0.91	0.00	0.00				
9.75	0.96	0.00	0.00				
10.00	1.02	0.00	0.00				
10.25	1.08	0.00	0.00				
10.50	1.14	0.00	0.00				
10.75	1.22	0.00	0.00				
11.00	1.32	0.00	0.00				
11.25	1.44	0.00	0.00				
11.50	1.59	0.00	0.00				
11.75	2.17	0.07	0.05				
12.00	3.72	0.54	0.86				
12.25	3.96	0.65	**2.90**				
12.50	4.12	0.72	1.92				
12.75	4.24	0.78	1.08				
13.00	4.33	0.82	0.70				
13.25	4.41	0.86	0.53				
13.50	4.48	0.90	0.43				
13.75	4.54	0.93	0.37				
14.00	4.60	0.96	0.33				
14.25	4.65	0.98	0.30				
14.50	4.70	1.01	0.27				
14.75	4.74	1.03	0.26				
15.00	4.79	1.05	0.25				
15.25	4.83	1.08	0.23				
15.50	4.87	1.10	0.22				
15.75	4.90	1.12	0.21				
16.00	4.94	1.13	0.20				
16.25	4.97	1.15	0.19				
16.50	5.00	1.17	0.18				
16.75	5.03	1.19	0.17				

Summary for Reach 9R: Pre

Inflow Area = 167,183 sf, 0.00% Impervious, Inflow Depth > 1.37" for 100-yr event
Inflow = 4.75 cfs @ 12.24 hrs, Volume= 19,056 cf
Outflow = 4.75 cfs @ 12.24 hrs, Volume= 19,056 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 9R: Pre



Hydrograph for Reach 9R: Pre

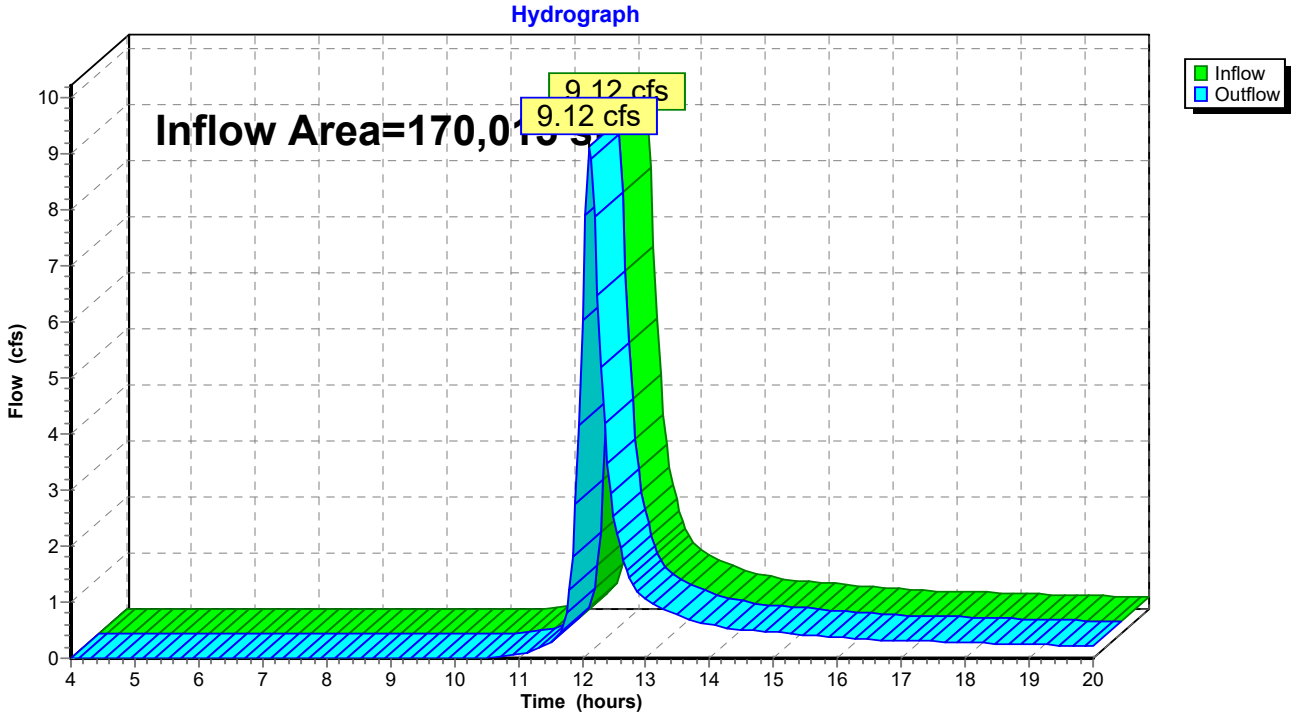
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.26		0.26
4.25	0.00		0.00	17.25	0.25		0.25
4.50	0.00		0.00	17.50	0.25		0.25
4.75	0.00		0.00	17.75	0.24		0.24
5.00	0.00		0.00	18.00	0.23		0.23
5.25	0.00		0.00	18.25	0.23		0.23
5.50	0.00		0.00	18.50	0.22		0.22
5.75	0.00		0.00	18.75	0.21		0.21
6.00	0.00		0.00	19.00	0.21		0.21
6.25	0.00		0.00	19.25	0.20		0.20
6.50	0.00		0.00	19.50	0.19		0.19
6.75	0.00		0.00	19.75	0.18		0.18
7.00	0.00		0.00	20.00	0.18		0.18
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.01		0.01				
11.75	0.11		0.11				
12.00	1.65		1.65				
12.25	**4.75**		**4.75**				
12.50	2.83		2.83				
12.75	1.58		1.58				
13.00	1.04		1.04				
13.25	0.79		0.79				
13.50	0.66		0.66				
13.75	0.58		0.58				
14.00	0.51		0.51				
14.25	0.46		0.46				
14.50	0.42		0.42				
14.75	0.40		0.40				
15.00	0.38		0.38				
15.25	0.36		0.36				
15.50	0.35		0.35				
15.75	0.33		0.33				
16.00	0.31		0.31				
16.25	0.29		0.29				
16.50	0.28		0.28				
16.75	0.27		0.27				

Summary for Reach 14R: Post

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 1.91" for 100-yr event
Inflow = 9.12 cfs @ 12.12 hrs, Volume= 27,017 cf
Outflow = 9.12 cfs @ 12.12 hrs, Volume= 27,017 cf, Atten= 0%, Lag= 0.0 min

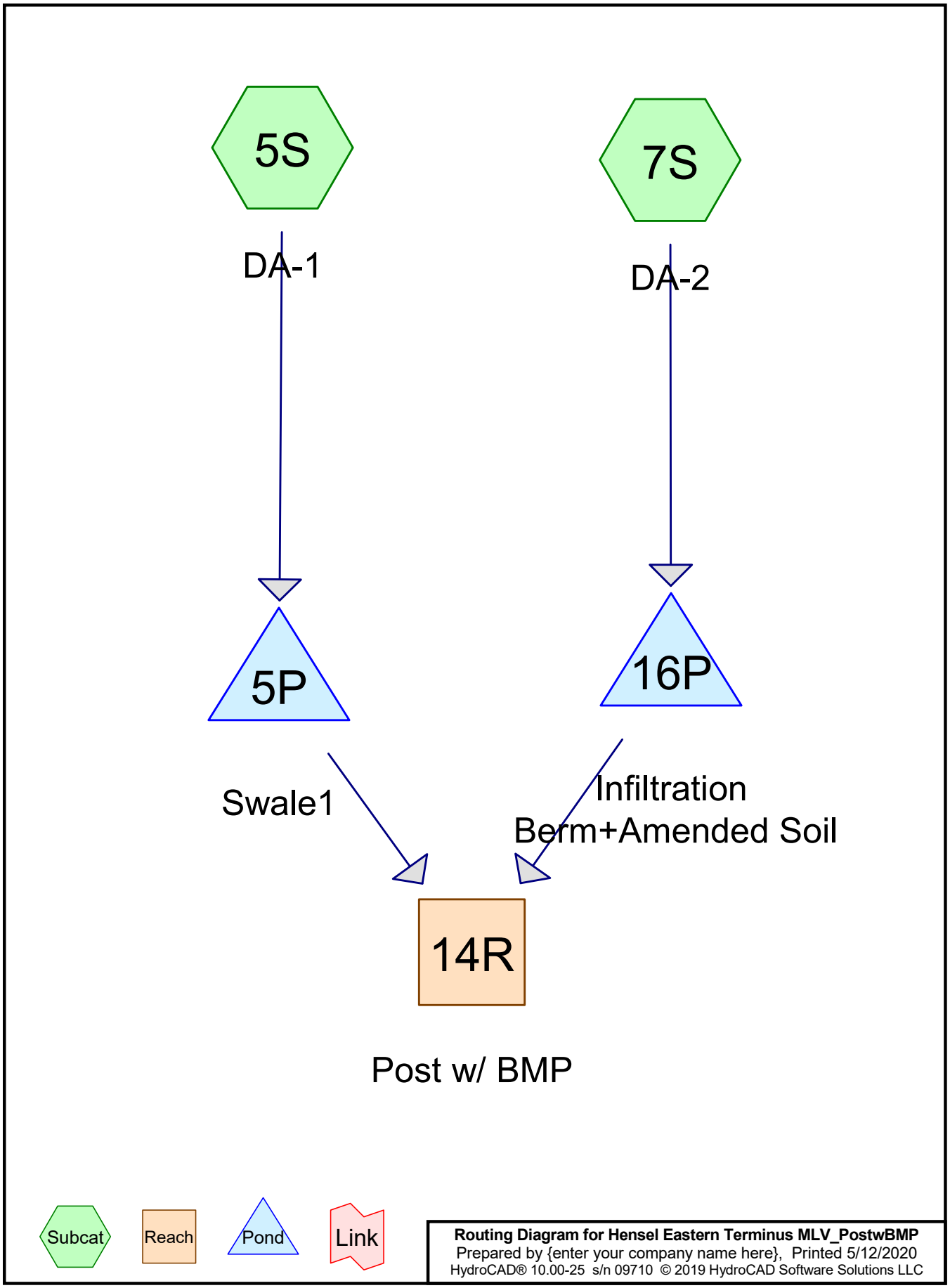
Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post



Hydrograph for Reach 14R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00	17.00	0.32		0.32
4.25	0.00		0.00	17.25	0.31		0.31
4.50	0.00		0.00	17.50	0.30		0.30
4.75	0.00		0.00	17.75	0.29		0.29
5.00	0.00		0.00	18.00	0.28		0.28
5.25	0.00		0.00	18.25	0.27		0.27
5.50	0.00		0.00	18.50	0.26		0.26
5.75	0.00		0.00	18.75	0.26		0.26
6.00	0.00		0.00	19.00	0.25		0.25
6.25	0.00		0.00	19.25	0.24		0.24
6.50	0.00		0.00	19.50	0.23		0.23
6.75	0.00		0.00	19.75	0.22		0.22
7.00	0.00		0.00	20.00	0.21		0.21
7.25	0.00		0.00				
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.01		0.01				
10.75	0.03		0.03				
11.00	0.08		0.08				
11.25	0.14		0.14				
11.50	0.26		0.26				
11.75	0.81		0.81				
12.00	**6.02**		**6.02**				
12.25	**6.48**		**6.48**				
12.50	2.54		2.54				
12.75	1.43		1.43				
13.00	1.05		1.05				
13.25	0.87		0.87				
13.50	0.76		0.76				
13.75	0.68		0.68				
14.00	0.60		0.60				
14.25	0.54		0.54				
14.50	0.51		0.51				
14.75	0.48		0.48				
15.00	0.46		0.46				
15.25	0.44		0.44				
15.50	0.42		0.42				
15.75	0.39		0.39				
16.00	0.37		0.37				
16.25	0.35		0.35				
16.50	0.33		0.33				
16.75	0.32		0.32				


5S
DA-1
7S
DA-2
5P
16P
Swale1
Infiltration
Berm+Amended Soil
14R
Post w/ BMP
Subcat
Reach
Pond
Link
Routing Diagram for Hensel Eastern Terminus MLV_PostwBMP
Prepared by {enter your company name here}, Printed 5/12/2020
HydroCAD® 10.00-25 s/n 09710 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
36,285	89	Gravel roads, HSG C (5S, 7S)
66,821	58	Meadow, non-grazed, HSG B (5S, 7S)
66,908	60	Woods, Fair, HSG B (5S, 7S)
170,015	**65**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
133,729	HSG B	5S, 7S
36,285	HSG C	5S, 7S
0	HSG D	
0	Other	
170,015		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcat Numbe
0	0	36,285	0	0	36,285	Gravel roads	
0	66,821	0	0	0	66,821	Meadow, non-grazed	
0	66,908	0	0	0	66,908	Woods, Fair	
0	**133,729**	**36,285**	**0**	**0**	**170,015**	**TOTAL AREA**	

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>0.31"
Flow Length=861' Tc=20.5 min CN=66 Runoff=0.46 cfs 1,994 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>0.28"
Flow Length=471' Tc=17.4 min CN=65 Runoff=0.52 cfs 2,123 cf

Reach 14R: Post w/ BMP Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond 5P: Swale1 Peak Elev=1,663.20' Storage=1,992 cf Inflow=0.46 cfs 1,994 cf
Outflow=0.00 cfs 0 cf

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,683.54' Storage=0.049 af Inflow=0.52 cfs 2,123 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 170,015 sf Runoff Volume = 4,118 cf Average Runoff Depth = 0.29"
100.00% Pervious = 170,015 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

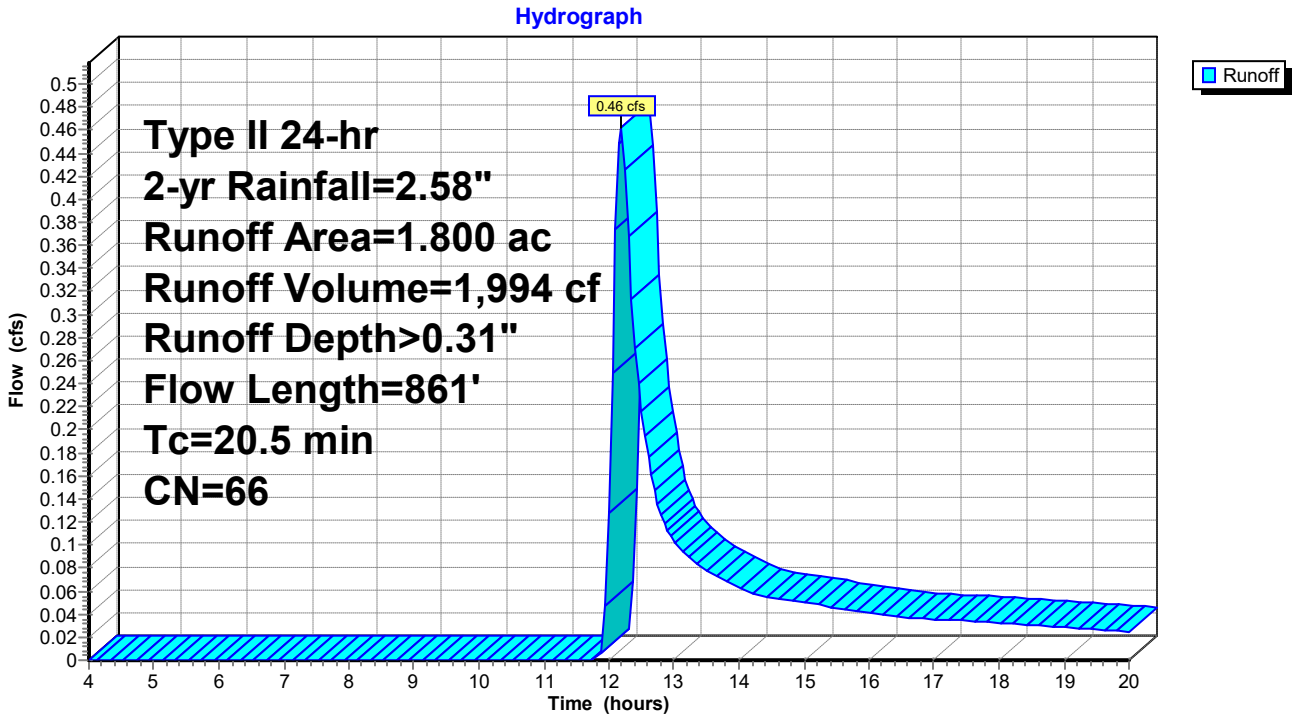
Runoff = 0.46 cfs @ 12.19 hrs, Volume= 1,994 cf, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.12	0.00	0.00
4.25	0.13	0.00	0.00
4.50	0.14	0.00	0.00
4.75	0.15	0.00	0.00
5.00	0.16	0.00	0.00
5.25	0.17	0.00	0.00
5.50	0.18	0.00	0.00
5.75	0.19	0.00	0.00
6.00	0.21	0.00	0.00
6.25	0.22	0.00	0.00
6.50	0.23	0.00	0.00
6.75	0.24	0.00	0.00
7.00	0.26	0.00	0.00
7.25	0.27	0.00	0.00
7.50	0.28	0.00	0.00
7.75	0.30	0.00	0.00
8.00	0.31	0.00	0.00
8.25	0.32	0.00	0.00
8.50	0.34	0.00	0.00
8.75	0.36	0.00	0.00
9.00	0.38	0.00	0.00
9.25	0.40	0.00	0.00
9.50	0.42	0.00	0.00
9.75	0.44	0.00	0.00
10.00	0.47	0.00	0.00
10.25	0.49	0.00	0.00
10.50	0.53	0.00	0.00
10.75	0.56	0.00	0.00
11.00	0.61	0.00	0.00
11.25	0.66	0.00	0.00
11.50	0.73	0.00	0.00
11.75	1.00	0.00	0.00
12.00	1.71	0.08	**0.13**
12.25	1.82	0.11	**0.43**
12.50	1.90	0.12	0.22
12.75	1.95	0.14	0.14
13.00	1.99	0.15	0.10
13.25	2.03	0.16	0.09
13.50	2.06	0.17	0.08
13.75	2.09	0.18	0.07
14.00	2.12	0.19	0.06
14.25	2.14	0.20	0.06
14.50	2.16	0.20	0.05
14.75	2.18	0.21	0.05
15.00	2.20	0.22	0.05
15.25	2.22	0.22	0.05
15.50	2.24	0.23	0.05
15.75	2.26	0.24	0.04
16.00	2.27	0.24	0.04
16.25	2.29	0.25	0.04
16.50	2.30	0.25	0.04
16.75	2.31	0.26	0.04
17.00	2.33	0.26	0.04
17.25	2.34	0.27	0.03
17.50	2.35	0.27	0.03
17.75	2.36	0.27	0.03
18.00	2.38	0.28	0.03
18.25	2.39	0.28	0.03
18.50	2.40	0.29	0.03
18.75	2.41	0.29	0.03
19.00	2.42	0.30	0.03
19.25	2.43	0.30	0.03
19.50	2.44	0.30	0.03
19.75	2.45	0.31	0.03
20.00	**2.46**	**0.31**	0.02

Summary for Subcatchment 7S: DA-2

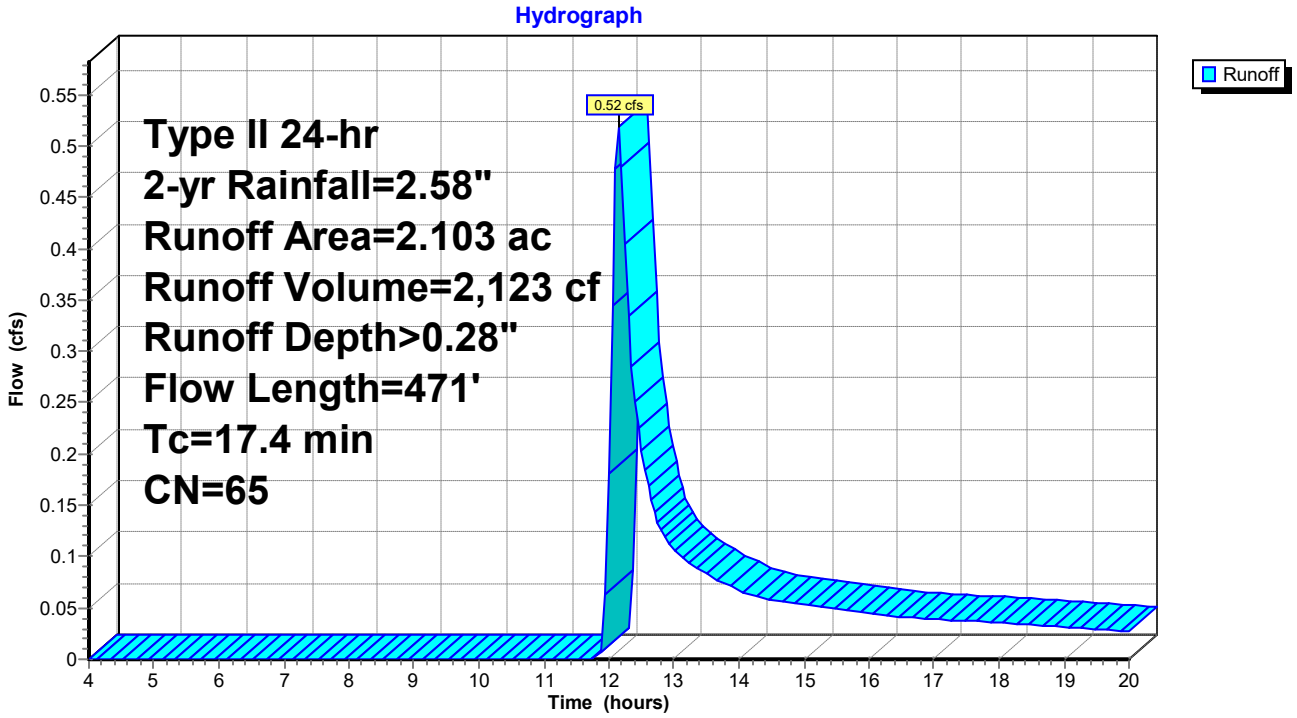
Runoff = 0.52 cfs @ 12.15 hrs, Volume= 2,123 cf, Depth> 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

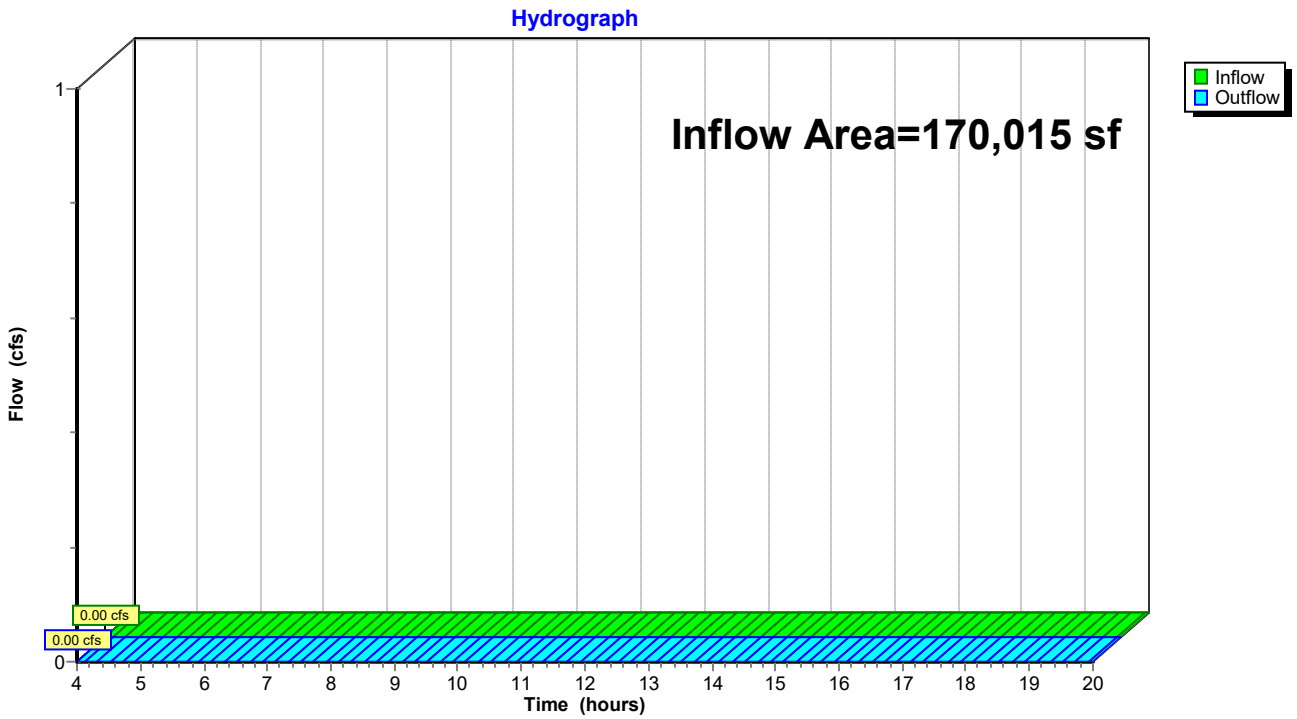
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.12	0.00	0.00
4.25	0.13	0.00	0.00
4.50	0.14	0.00	0.00
4.75	0.15	0.00	0.00
5.00	0.16	0.00	0.00
5.25	0.17	0.00	0.00
5.50	0.18	0.00	0.00
5.75	0.19	0.00	0.00
6.00	0.21	0.00	0.00
6.25	0.22	0.00	0.00
6.50	0.23	0.00	0.00
6.75	0.24	0.00	0.00
7.00	0.26	0.00	0.00
7.25	0.27	0.00	0.00
7.50	0.28	0.00	0.00
7.75	0.30	0.00	0.00
8.00	0.31	0.00	0.00
8.25	0.32	0.00	0.00
8.50	0.34	0.00	0.00
8.75	0.36	0.00	0.00
9.00	0.38	0.00	0.00
9.25	0.40	0.00	0.00
9.50	0.42	0.00	0.00
9.75	0.44	0.00	0.00
10.00	0.47	0.00	0.00
10.25	0.49	0.00	0.00
10.50	0.53	0.00	0.00
10.75	0.56	0.00	0.00
11.00	0.61	0.00	0.00
11.25	0.66	0.00	0.00
11.50	0.73	0.00	0.00
11.75	1.00	0.00	0.00
12.00	1.71	0.07	**0.18**
12.25	1.82	0.09	**0.40**
12.50	1.90	0.11	0.20
12.75	1.95	0.12	0.13
13.00	1.99	0.13	0.11
13.25	2.03	0.14	0.09
13.50	2.06	0.15	0.08
13.75	2.09	0.16	0.07
14.00	2.12	0.17	0.07
14.25	2.14	0.17	0.06
14.50	2.16	0.18	0.06
14.75	2.18	0.19	0.06
15.00	2.20	0.19	0.05
15.25	2.22	0.20	0.05
15.50	2.24	0.21	0.05
15.75	2.26	0.21	0.05
16.00	2.27	0.22	0.04
16.25	2.29	0.22	0.04
16.50	2.30	0.23	0.04
16.75	2.31	0.23	0.04
17.00	2.33	0.24	0.04
17.25	2.34	0.24	0.04
17.50	2.35	0.24	0.04
17.75	2.36	0.25	0.04
18.00	2.38	0.25	0.04
18.25	2.39	0.26	0.03
18.50	2.40	0.26	0.03
18.75	2.41	0.26	0.03
19.00	2.42	0.27	0.03
19.25	2.43	0.27	0.03
19.50	2.44	0.27	0.03
19.75	2.45	0.28	0.03
20.00	**2.46**	**0.28**	0.03

Summary for Reach 14R: Post w/ BMP

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post w/ BMP



Hydrograph for Reach 14R: Post w/ BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	**0.00**		**0.00**	16.75	0.00		0.00
4.25	0.00		0.00	17.00	0.00		0.00
4.50	0.00		0.00	17.25	0.00		0.00
4.75	0.00		0.00	17.50	0.00		0.00
5.00	0.00		0.00	17.75	0.00		0.00
5.25	0.00		0.00	18.00	0.00		0.00
5.50	0.00		0.00	18.25	0.00		0.00
5.75	0.00		0.00	18.50	0.00		0.00
6.00	0.00		0.00	18.75	0.00		0.00
6.25	0.00		0.00	19.00	0.00		0.00
6.50	0.00		0.00	19.25	0.00		0.00
6.75	0.00		0.00	19.50	0.00		0.00
7.00	0.00		0.00	19.75	0.00		0.00
7.25	0.00		0.00	20.00	0.00		0.00
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.00		0.00				
12.00	0.00		0.00				
12.25	0.00		0.00				
12.50	0.00		0.00				
12.75	0.00		0.00				
13.00	0.00		0.00				
13.25	0.00		0.00				
13.50	0.00		0.00				
13.75	0.00		0.00				
14.00	0.00		0.00				
14.25	0.00		0.00				
14.50	0.00		0.00				
14.75	0.00		0.00				
15.00	0.00		0.00				
15.25	0.00		0.00				
15.50	0.00		0.00				
15.75	0.00		0.00				
16.00	0.00		0.00				
16.25	0.00		0.00				
16.50	0.00		0.00				

Summary for Pond 5P: Swale1

Inflow Area = 78,408 sf, 0.00% Impervious, Inflow Depth > 0.31" for 2-yr event
Inflow = 0.46 cfs @ 12.19 hrs, Volume= 1,994 cf
Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,663.20' @ 20.00 hrs Surf.Area= 2,363 sf Storage= 1,992 cf

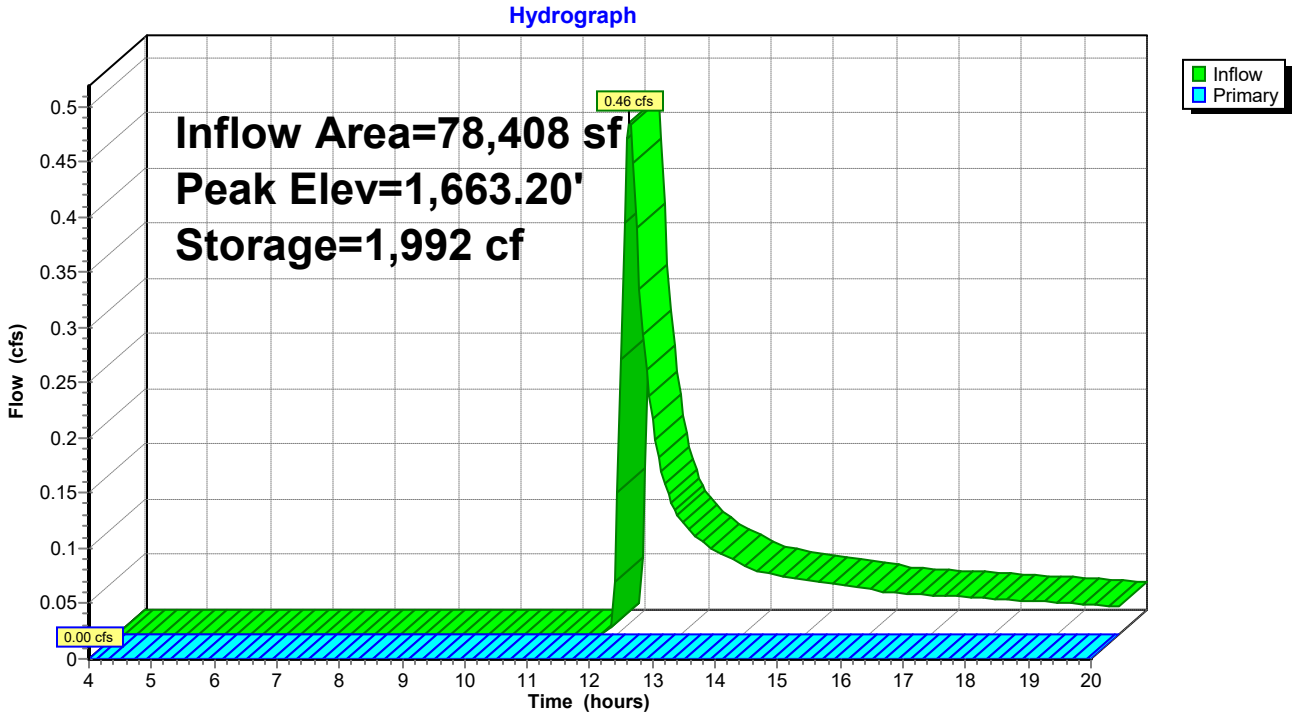
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,662.00'	13,877 cf	**8.00'W x 125.00'L x 4.00'H Prismatoid Z=4.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,665.50'	**180.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 4.00 hrs HW=1,662.00' (Free Discharge)
└**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Swale1



Hydrograph for Pond 5P: Swale1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0	1,662.00	**0.00**
4.50	0.00	0	1,662.00	0.00
5.00	0.00	0	1,662.00	0.00
5.50	0.00	0	1,662.00	0.00
6.00	0.00	0	1,662.00	0.00
6.50	0.00	0	1,662.00	0.00
7.00	0.00	0	1,662.00	0.00
7.50	0.00	0	1,662.00	0.00
8.00	0.00	0	1,662.00	0.00
8.50	0.00	0	1,662.00	0.00
9.00	0.00	0	1,662.00	0.00
9.50	0.00	0	1,662.00	0.00
10.00	0.00	0	1,662.00	0.00
10.50	0.00	0	1,662.00	0.00
11.00	0.00	0	1,662.00	0.00
11.50	0.00	0	1,662.00	0.00
12.00	**0.13**	22	1,662.02	0.00
12.50	**0.22**	620	1,662.49	0.00
13.00	0.10	880	1,662.65	0.00
13.50	0.08	1,039	1,662.74	0.00
14.00	0.06	1,166	1,662.81	0.00
14.50	0.05	1,269	1,662.86	0.00
15.00	0.05	1,363	1,662.91	0.00
15.50	0.05	1,449	1,662.95	0.00
16.00	0.04	1,527	1,662.99	0.00
16.50	0.04	1,597	1,663.02	0.00
17.00	0.04	1,662	1,663.05	0.00
17.50	0.03	1,725	1,663.08	0.00
18.00	0.03	1,785	1,663.11	0.00
18.50	0.03	1,842	1,663.13	0.00
19.00	0.03	1,895	1,663.15	0.00
19.50	0.03	1,945	1,663.18	0.00
20.00	0.02	**1,992**	**1,663.20**	0.00

Stage-Discharge for Pond 5P: Swale1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,662.00	0.00	1,663.02	0.00	1,664.04	0.00	1,665.06	0.00
1,662.02	0.00	1,663.04	0.00	1,664.06	0.00	1,665.08	0.00
1,662.04	0.00	1,663.06	0.00	1,664.08	0.00	1,665.10	0.00
1,662.06	0.00	1,663.08	0.00	1,664.10	0.00	1,665.12	0.00
1,662.08	0.00	1,663.10	0.00	1,664.12	0.00	1,665.14	0.00
1,662.10	0.00	1,663.12	0.00	1,664.14	0.00	1,665.16	0.00
1,662.12	0.00	1,663.14	0.00	1,664.16	0.00	1,665.18	0.00
1,662.14	0.00	1,663.16	0.00	1,664.18	0.00	1,665.20	0.00
1,662.16	0.00	1,663.18	0.00	1,664.20	0.00	1,665.22	0.00
1,662.18	0.00	1,663.20	0.00	1,664.22	0.00	1,665.24	0.00
1,662.20	0.00	1,663.22	0.00	1,664.24	0.00	1,665.26	0.00
1,662.22	0.00	1,663.24	0.00	1,664.26	0.00	1,665.28	0.00
1,662.24	0.00	1,663.26	0.00	1,664.28	0.00	1,665.30	0.00
1,662.26	0.00	1,663.28	0.00	1,664.30	0.00	1,665.32	0.00
1,662.28	0.00	1,663.30	0.00	1,664.32	0.00	1,665.34	0.00
1,662.30	0.00	1,663.32	0.00	1,664.34	0.00	1,665.36	0.00
1,662.32	0.00	1,663.34	0.00	1,664.36	0.00	1,665.38	0.00
1,662.34	0.00	1,663.36	0.00	1,664.38	0.00	1,665.40	0.00
1,662.36	0.00	1,663.38	0.00	1,664.40	0.00	1,665.42	0.00
1,662.38	0.00	1,663.40	0.00	1,664.42	0.00	1,665.44	0.00
1,662.40	0.00	1,663.42	0.00	1,664.44	0.00	1,665.46	0.00
1,662.42	0.00	1,663.44	0.00	1,664.46	0.00	1,665.48	0.00
1,662.44	0.00	1,663.46	0.00	1,664.48	0.00	1,665.50	0.00
1,662.46	0.00	1,663.48	0.00	1,664.50	0.00	1,665.52	1.66
1,662.48	0.00	1,663.50	0.00	1,664.52	0.00	1,665.54	4.71
1,662.50	0.00	1,663.52	0.00	1,664.54	0.00	1,665.56	8.65
1,662.52	0.00	1,663.54	0.00	1,664.56	0.00	1,665.58	13.32
1,662.54	0.00	1,663.56	0.00	1,664.58	0.00	1,665.60	18.61
1,662.56	0.00	1,663.58	0.00	1,664.60	0.00	1,665.62	24.46
1,662.58	0.00	1,663.60	0.00	1,664.62	0.00	1,665.64	30.83
1,662.60	0.00	1,663.62	0.00	1,664.64	0.00	1,665.66	37.66
1,662.62	0.00	1,663.64	0.00	1,664.66	0.00	1,665.68	44.94
1,662.64	0.00	1,663.66	0.00	1,664.68	0.00	1,665.70	52.63
1,662.66	0.00	1,663.68	0.00	1,664.70	0.00	1,665.72	60.72
1,662.68	0.00	1,663.70	0.00	1,664.72	0.00	1,665.74	69.19
1,662.70	0.00	1,663.72	0.00	1,664.74	0.00	1,665.76	78.01
1,662.72	0.00	1,663.74	0.00	1,664.76	0.00	1,665.78	87.18
1,662.74	0.00	1,663.76	0.00	1,664.78	0.00	1,665.80	96.68
1,662.76	0.00	1,663.78	0.00	1,664.80	0.00	1,665.82	106.51
1,662.78	0.00	1,663.80	0.00	1,664.82	0.00	1,665.84	116.65
1,662.80	0.00	1,663.82	0.00	1,664.84	0.00	1,665.86	127.09
1,662.82	0.00	1,663.84	0.00	1,664.86	0.00	1,665.88	137.82
1,662.84	0.00	1,663.86	0.00	1,664.88	0.00	1,665.90	148.84
1,662.86	0.00	1,663.88	0.00	1,664.90	0.00	1,665.92	160.14
1,662.88	0.00	1,663.90	0.00	1,664.92	0.00	1,665.94	171.71
1,662.90	0.00	1,663.92	0.00	1,664.94	0.00	1,665.96	183.54
1,662.92	0.00	1,663.94	0.00	1,664.96	0.00	1,665.98	195.64
1,662.94	0.00	1,663.96	0.00	1,664.98	0.00	1,666.00	**207.99**
1,662.96	0.00	1,663.98	0.00	1,665.00	0.00		
1,662.98	0.00	1,664.00	0.00	1,665.02	0.00		
1,663.00	0.00	1,664.02	0.00	1,665.04	0.00		

Stage-Area-Storage for Pond 5P: Swale1

Elevation (feet)	Storage (cubic-feet)
1,662.00	0
1,662.05	51
1,662.10	105
1,662.15	162
1,662.20	221
1,662.25	284
1,662.30	348
1,662.35	416
1,662.40	486
1,662.45	560
1,662.50	636
1,662.55	714
1,662.60	796
1,662.65	881
1,662.70	968
1,662.75	1,058
1,662.80	1,151
1,662.85	1,247
1,662.90	1,346
1,662.95	1,448
1,663.00	1,553
1,663.05	1,661
1,663.10	1,772
1,663.15	1,886
1,663.20	2,003
1,663.25	2,123
1,663.30	2,246
1,663.35	2,372
1,663.40	2,501
1,663.45	2,634
1,663.50	2,769
1,663.55	2,908
1,663.60	3,049
1,663.65	3,194
1,663.70	3,342
1,663.75	3,494
1,663.80	3,648
1,663.85	3,806
1,663.90	3,967
1,663.95	4,131
1,664.00	4,299
1,664.05	4,470
1,664.10	4,644
1,664.15	4,821
1,664.20	5,002
1,664.25	5,186
1,664.30	5,374
1,664.35	5,565
1,664.40	5,759
1,664.45	5,957
1,664.50	6,158
1,664.55	6,363
1,664.60	6,571
1,664.65	6,783
1,664.70	6,998
1,664.75	7,217
1,664.80	7,439
1,664.85	7,665
1,664.90	7,894
1,664.95	8,127
1,665.00	8,364
1,665.05	8,604
1,665.10	8,848
1,665.15	9,096
1,665.20	9,347
1,665.25	9,602
1,665.30	9,860
1,665.35	10,122
1,665.40	10,388
1,665.45	10,658
1,665.50	10,932
1,665.55	11,209
1,665.60	11,490
1,665.65	11,775
1,665.70	12,064
1,665.75	12,356
1,665.80	12,653
1,665.85	12,953
1,665.90	13,257
1,665.95	13,565
1,666.00	**13,877**

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area = 91,607 sf, 0.00% Impervious, Inflow Depth > 0.28" for 2-yr event
Inflow = 0.52 cfs @ 12.15 hrs, Volume= 2,123 cf
Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,683.54' @ 20.00 hrs Surf.Area= 0.095 ac Storage= 0.049 af

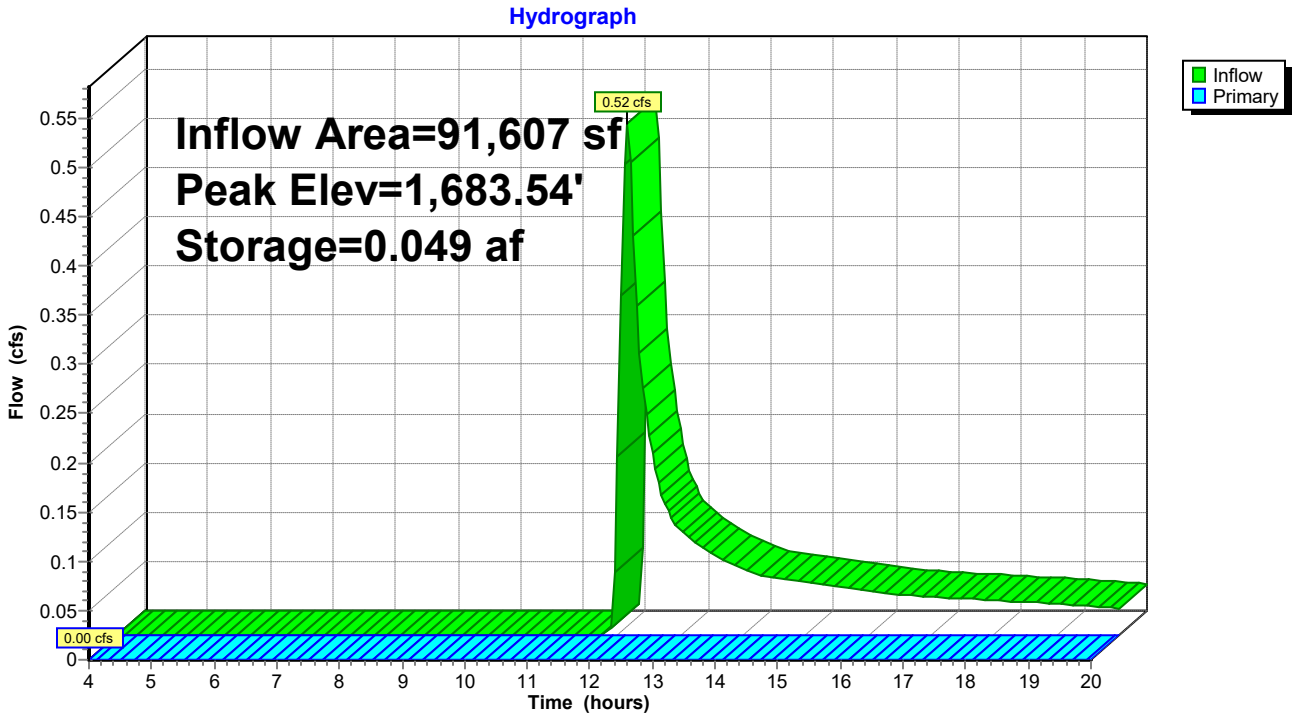
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,683.00'	0.159 af	**25.00'W x 150.00'L x 1.60'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,684.50'	**150.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 4.00 hrs HW=1,683.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0.000	1,683.00	**0.00**
4.50	0.00	0.000	1,683.00	0.00
5.00	0.00	0.000	1,683.00	0.00
5.50	0.00	0.000	1,683.00	0.00
6.00	0.00	0.000	1,683.00	0.00
6.50	0.00	0.000	1,683.00	0.00
7.00	0.00	0.000	1,683.00	0.00
7.50	0.00	0.000	1,683.00	0.00
8.00	0.00	0.000	1,683.00	0.00
8.50	0.00	0.000	1,683.00	0.00
9.00	0.00	0.000	1,683.00	0.00
9.50	0.00	0.000	1,683.00	0.00
10.00	0.00	0.000	1,683.00	0.00
10.50	0.00	0.000	1,683.00	0.00
11.00	0.00	0.000	1,683.00	0.00
11.50	0.00	0.000	1,683.00	0.00
12.00	**0.18**	0.001	1,683.01	0.00
12.50	**0.20**	0.015	1,683.17	0.00
13.00	0.11	0.021	1,683.24	0.00
13.50	0.08	0.025	1,683.28	0.00
14.00	0.07	0.028	1,683.32	0.00
14.50	0.06	0.031	1,683.34	0.00
15.00	0.05	0.033	1,683.37	0.00
15.50	0.05	0.035	1,683.39	0.00
16.00	0.04	0.037	1,683.41	0.00
16.50	0.04	0.039	1,683.43	0.00
17.00	0.04	0.040	1,683.45	0.00
17.50	0.04	0.042	1,683.47	0.00
18.00	0.04	0.043	1,683.48	0.00
18.50	0.03	0.045	1,683.50	0.00
19.00	0.03	0.046	1,683.51	0.00
19.50	0.03	0.048	1,683.53	0.00
20.00	0.03	**0.049**	**1,683.54**	0.00

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,683.00	0.00	1,683.51	0.00	1,684.02	0.00	1,684.53	1.98
1,683.01	0.00	1,683.52	0.00	1,684.03	0.00	1,684.54	3.05
1,683.02	0.00	1,683.53	0.00	1,684.04	0.00	1,684.55	4.26
1,683.03	0.00	1,683.54	0.00	1,684.05	0.00	1,684.56	5.60
1,683.04	0.00	1,683.55	0.00	1,684.06	0.00	1,684.57	7.06
1,683.05	0.00	1,683.56	0.00	1,684.07	0.00	1,684.58	8.62
1,683.06	0.00	1,683.57	0.00	1,684.08	0.00	1,684.59	10.29
1,683.07	0.00	1,683.58	0.00	1,684.09	0.00	1,684.60	**12.05**
1,683.08	0.00	1,683.59	0.00	1,684.10	0.00		
1,683.09	0.00	1,683.60	0.00	1,684.11	0.00		
1,683.10	0.00	1,683.61	0.00	1,684.12	0.00		
1,683.11	0.00	1,683.62	0.00	1,684.13	0.00		
1,683.12	0.00	1,683.63	0.00	1,684.14	0.00		
1,683.13	0.00	1,683.64	0.00	1,684.15	0.00		
1,683.14	0.00	1,683.65	0.00	1,684.16	0.00		
1,683.15	0.00	1,683.66	0.00	1,684.17	0.00		
1,683.16	0.00	1,683.67	0.00	1,684.18	0.00		
1,683.17	0.00	1,683.68	0.00	1,684.19	0.00		
1,683.18	0.00	1,683.69	0.00	1,684.20	0.00		
1,683.19	0.00	1,683.70	0.00	1,684.21	0.00		
1,683.20	0.00	1,683.71	0.00	1,684.22	0.00		
1,683.21	0.00	1,683.72	0.00	1,684.23	0.00		
1,683.22	0.00	1,683.73	0.00	1,684.24	0.00		
1,683.23	0.00	1,683.74	0.00	1,684.25	0.00		
1,683.24	0.00	1,683.75	0.00	1,684.26	0.00		
1,683.25	0.00	1,683.76	0.00	1,684.27	0.00		
1,683.26	0.00	1,683.77	0.00	1,684.28	0.00		
1,683.27	0.00	1,683.78	0.00	1,684.29	0.00		
1,683.28	0.00	1,683.79	0.00	1,684.30	0.00		
1,683.29	0.00	1,683.80	0.00	1,684.31	0.00		
1,683.30	0.00	1,683.81	0.00	1,684.32	0.00		
1,683.31	0.00	1,683.82	0.00	1,684.33	0.00		
1,683.32	0.00	1,683.83	0.00	1,684.34	0.00		
1,683.33	0.00	1,683.84	0.00	1,684.35	0.00		
1,683.34	0.00	1,683.85	0.00	1,684.36	0.00		
1,683.35	0.00	1,683.86	0.00	1,684.37	0.00		
1,683.36	0.00	1,683.87	0.00	1,684.38	0.00		
1,683.37	0.00	1,683.88	0.00	1,684.39	0.00		
1,683.38	0.00	1,683.89	0.00	1,684.40	0.00		
1,683.39	0.00	1,683.90	0.00	1,684.41	0.00		
1,683.40	0.00	1,683.91	0.00	1,684.42	0.00		
1,683.41	0.00	1,683.92	0.00	1,684.43	0.00		
1,683.42	0.00	1,683.93	0.00	1,684.44	0.00		
1,683.43	0.00	1,683.94	0.00	1,684.45	0.00		
1,683.44	0.00	1,683.95	0.00	1,684.46	0.00		
1,683.45	0.00	1,683.96	0.00	1,684.47	0.00		
1,683.46	0.00	1,683.97	0.00	1,684.48	0.00		
1,683.47	0.00	1,683.98	0.00	1,684.49	0.00		
1,683.48	0.00	1,683.99	0.00	1,684.50	0.00		
1,683.49	0.00	1,684.00	0.00	1,684.51	0.38		
1,683.50	0.00	1,684.01	0.00	1,684.52	1.08		

Stage-Area-Storage for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Storage (acre-feet)
1,683.00	0.000
1,683.02	0.002
1,683.04	0.003
1,683.06	0.005
1,683.08	0.007
1,683.10	0.009
1,683.12	0.010
1,683.14	0.012
1,683.16	0.014
1,683.18	0.016
1,683.20	0.018
1,683.22	0.019
1,683.24	0.021
1,683.26	0.023
1,683.28	0.025
1,683.30	0.027
1,683.32	0.028
1,683.34	0.030
1,683.36	0.032
1,683.38	0.034
1,683.40	0.036
1,683.42	0.038
1,683.44	0.039
1,683.46	0.041
1,683.48	0.043
1,683.50	0.045
1,683.52	0.047
1,683.54	0.049
1,683.56	0.051
1,683.58	0.053
1,683.60	0.055
1,683.62	0.056
1,683.64	0.058
1,683.66	0.060
1,683.68	0.062
1,683.70	0.064
1,683.72	0.066
1,683.74	0.068
1,683.76	0.070
1,683.78	0.072
1,683.80	0.074
1,683.82	0.076
1,683.84	0.078
1,683.86	0.080
1,683.88	0.082
1,683.90	0.084
1,683.92	0.086
1,683.94	0.088
1,683.96	0.090
1,683.98	0.092
1,684.00	0.094
1,684.02	0.096
1,684.04	0.098
1,684.06	0.100
1,684.08	0.103
1,684.10	0.105
1,684.12	0.107
1,684.14	0.109
1,684.16	0.111
1,684.18	0.113
1,684.20	0.115
1,684.22	0.117
1,684.24	0.119
1,684.26	0.121
1,684.28	0.124
1,684.30	0.126
1,684.32	0.128
1,684.34	0.130
1,684.36	0.132
1,684.38	0.134
1,684.40	0.137
1,684.42	0.139
1,684.44	0.141
1,684.46	0.143
1,684.48	0.145
1,684.50	0.148
1,684.52	0.150
1,684.54	0.152
1,684.56	0.154
1,684.58	0.157
1,684.60	**0.159**

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=861' Tc=20.5 min CN=66 Runoff=1.53 cfs 5,123 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>0.74"
Flow Length=471' Tc=17.4 min CN=65 Runoff=1.83 cfs 5,630 cf

Reach 14R: Post w/ BMP Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond 5P: Swale1 Peak Elev=1,664.23' Storage=5,118 cf Inflow=1.53 cfs 5,123 cf
Outflow=0.00 cfs 0 cf

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,684.33' Storage=0.129 af Inflow=1.83 cfs 5,630 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 170,015 sf Runoff Volume = 10,753 cf Average Runoff Depth = 0.76"
100.00% Pervious = 170,015 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

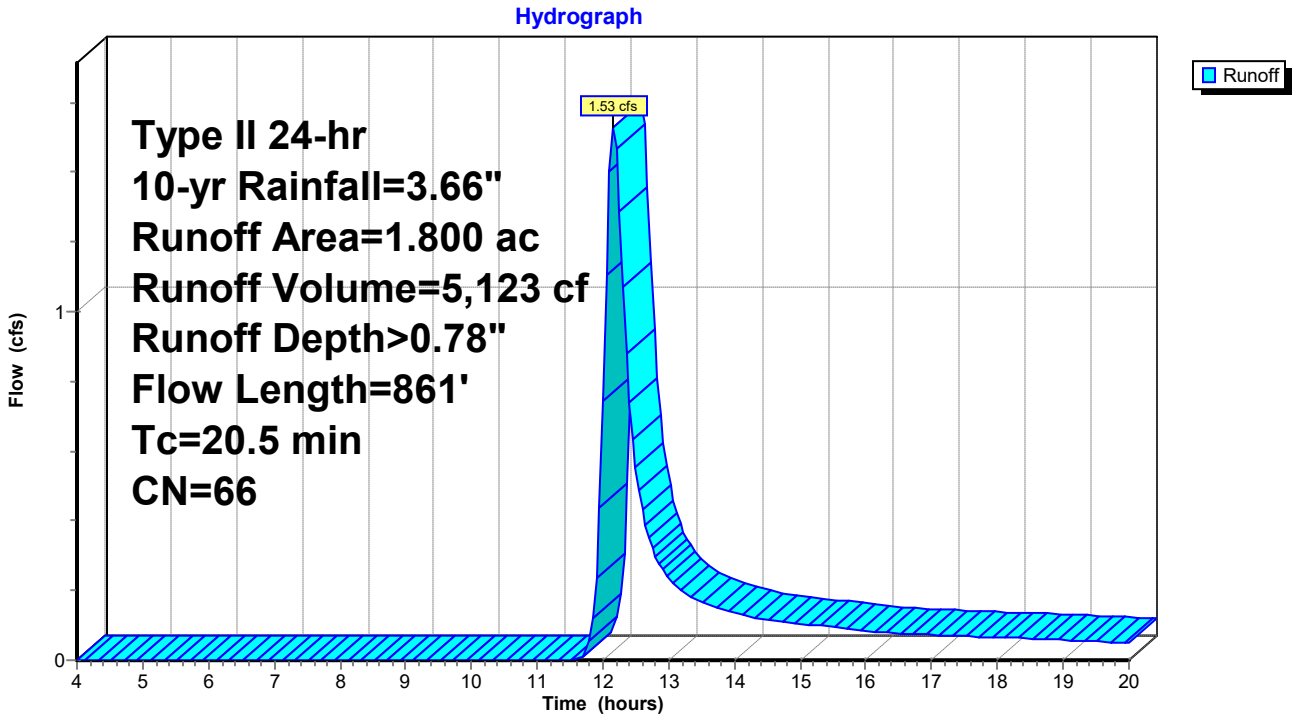
Runoff = 1.53 cfs @ 12.16 hrs, Volume= 5,123 cf, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00
4.25	0.19	0.00	0.00
4.50	0.20	0.00	0.00
4.75	0.22	0.00	0.00
5.00	0.23	0.00	0.00
5.25	0.25	0.00	0.00
5.50	0.26	0.00	0.00
5.75	0.28	0.00	0.00
6.00	0.29	0.00	0.00
6.25	0.31	0.00	0.00
6.50	0.33	0.00	0.00
6.75	0.34	0.00	0.00
7.00	0.36	0.00	0.00
7.25	0.38	0.00	0.00
7.50	0.40	0.00	0.00
7.75	0.42	0.00	0.00
8.00	0.44	0.00	0.00
8.25	0.46	0.00	0.00
8.50	0.48	0.00	0.00
8.75	0.51	0.00	0.00
9.00	0.54	0.00	0.00
9.25	0.57	0.00	0.00
9.50	0.60	0.00	0.00
9.75	0.63	0.00	0.00
10.00	0.66	0.00	0.00
10.25	0.70	0.00	0.00
10.50	0.75	0.00	0.00
10.75	0.80	0.00	0.00
11.00	0.86	0.00	0.00
11.25	0.94	0.00	0.00
11.50	1.04	0.00	0.00
11.75	1.42	0.03	0.02
12.00	2.43	0.30	**0.75**
12.25	2.58	0.36	**1.29**
12.50	2.69	0.40	0.55
12.75	2.76	0.44	0.32
13.00	2.83	0.46	0.23
13.25	2.88	0.49	0.19
13.50	2.92	0.51	0.17
13.75	2.97	0.53	0.15
14.00	3.00	0.55	0.14
14.25	3.03	0.56	0.12
14.50	3.07	0.58	0.11
14.75	3.10	0.59	0.11
15.00	3.12	0.60	0.10
15.25	3.15	0.62	0.10
15.50	3.18	0.63	0.09
15.75	3.20	0.64	0.09
16.00	3.22	0.65	0.08
16.25	3.24	0.66	0.08
16.50	3.26	0.67	0.08
16.75	3.28	0.68	0.07
17.00	3.30	0.69	0.07
17.25	3.32	0.70	0.07
17.50	3.34	0.71	0.07
17.75	3.35	0.72	0.07
18.00	3.37	0.73	0.07
18.25	3.39	0.74	0.06
18.50	3.40	0.75	0.06
18.75	3.42	0.76	0.06
19.00	3.43	0.76	0.06
19.25	3.45	0.77	0.06
19.50	3.46	0.78	0.05
19.75	3.47	0.79	0.05
20.00	**3.48**	**0.79**	0.05

Summary for Subcatchment 7S: DA-2

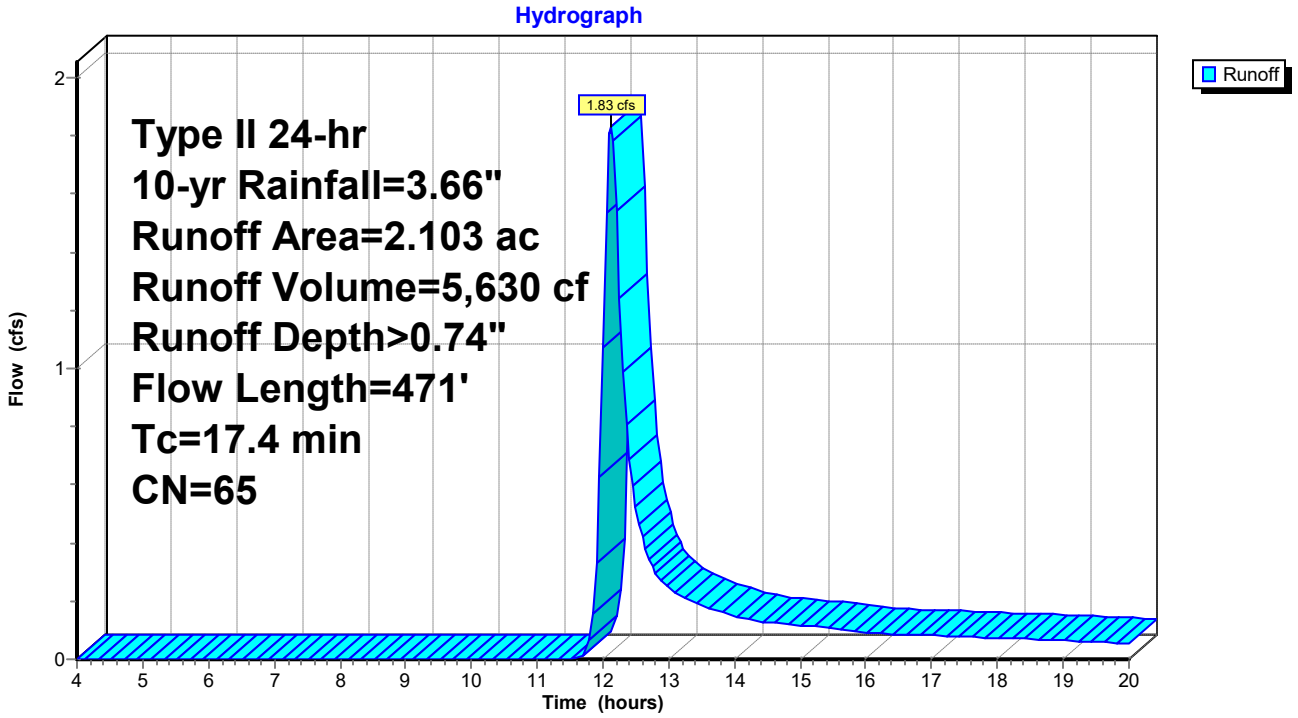
Runoff = 1.83 cfs @ 12.12 hrs, Volume= 5,630 cf, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

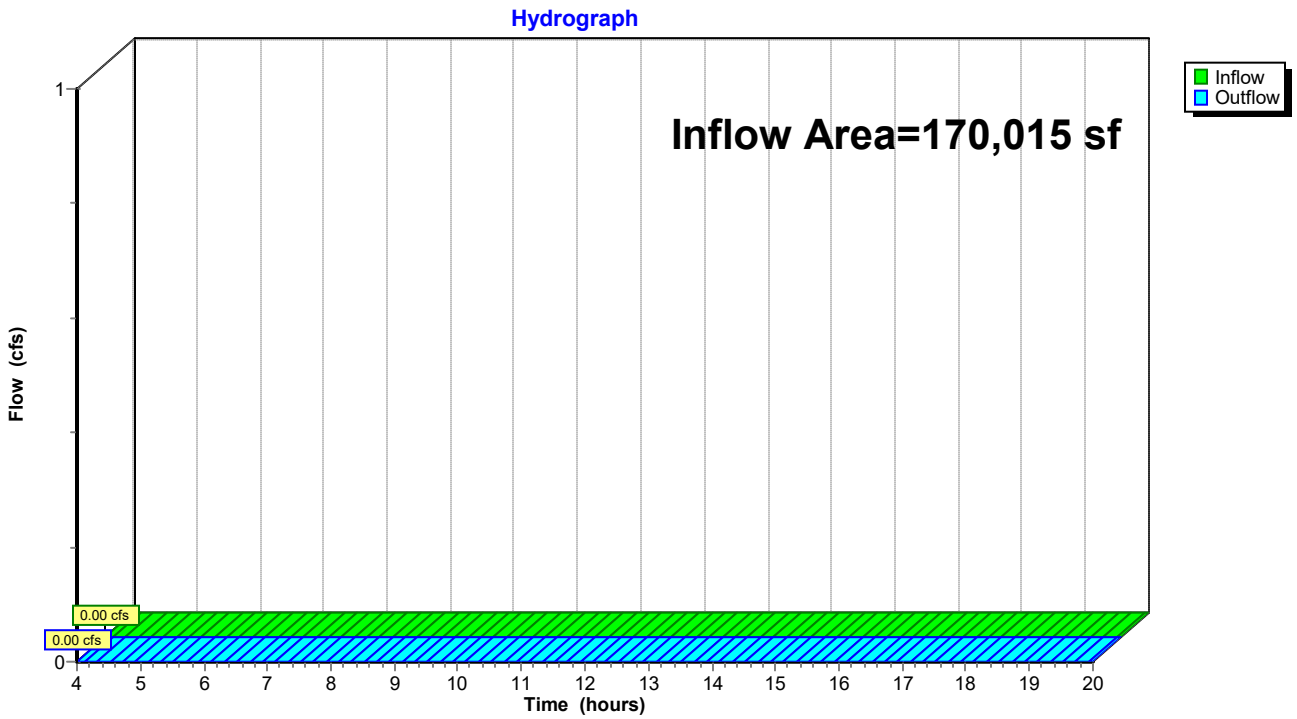
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.18	0.00	0.00
4.25	0.19	0.00	0.00
4.50	0.20	0.00	0.00
4.75	0.22	0.00	0.00
5.00	0.23	0.00	0.00
5.25	0.25	0.00	0.00
5.50	0.26	0.00	0.00
5.75	0.28	0.00	0.00
6.00	0.29	0.00	0.00
6.25	0.31	0.00	0.00
6.50	0.33	0.00	0.00
6.75	0.34	0.00	0.00
7.00	0.36	0.00	0.00
7.25	0.38	0.00	0.00
7.50	0.40	0.00	0.00
7.75	0.42	0.00	0.00
8.00	0.44	0.00	0.00
8.25	0.46	0.00	0.00
8.50	0.48	0.00	0.00
8.75	0.51	0.00	0.00
9.00	0.54	0.00	0.00
9.25	0.57	0.00	0.00
9.50	0.60	0.00	0.00
9.75	0.63	0.00	0.00
10.00	0.66	0.00	0.00
10.25	0.70	0.00	0.00
10.50	0.75	0.00	0.00
10.75	0.80	0.00	0.00
11.00	0.86	0.00	0.00
11.25	0.94	0.00	0.00
11.50	1.04	0.00	0.00
11.75	1.42	0.02	0.02
12.00	2.43	0.27	**1.07**
12.25	2.58	0.33	**1.24**
12.50	2.69	0.37	0.52
12.75	2.76	0.40	0.32
13.00	2.83	0.43	0.25
13.25	2.88	0.45	0.21
13.50	2.92	0.47	0.19
13.75	2.97	0.49	0.17
14.00	3.00	0.51	0.15
14.25	3.03	0.52	0.13
14.50	3.07	0.54	0.13
14.75	3.10	0.55	0.12
15.00	3.12	0.56	0.12
15.25	3.15	0.58	0.11
15.50	3.18	0.59	0.11
15.75	3.20	0.60	0.10
16.00	3.22	0.61	0.09
16.25	3.24	0.62	0.09
16.50	3.26	0.63	0.09
16.75	3.28	0.64	0.08
17.00	3.30	0.65	0.08
17.25	3.32	0.66	0.08
17.50	3.34	0.67	0.08
17.75	3.35	0.68	0.08
18.00	3.37	0.69	0.07
18.25	3.39	0.69	0.07
18.50	3.40	0.70	0.07
18.75	3.42	0.71	0.07
19.00	3.43	0.72	0.06
19.25	3.45	0.72	0.06
19.50	3.46	0.73	0.06
19.75	3.47	0.74	0.06
20.00	**3.48**	**0.74**	0.06

Summary for Reach 14R: Post w/ BMP

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth = 0.00" for 10-yr event
Inflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post w/ BMP



Hydrograph for Reach 14R: Post w/ BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	**0.00**		**0.00**	16.75	0.00		0.00
4.25	0.00		0.00	17.00	0.00		0.00
4.50	0.00		0.00	17.25	0.00		0.00
4.75	0.00		0.00	17.50	0.00		0.00
5.00	0.00		0.00	17.75	0.00		0.00
5.25	0.00		0.00	18.00	0.00		0.00
5.50	0.00		0.00	18.25	0.00		0.00
5.75	0.00		0.00	18.50	0.00		0.00
6.00	0.00		0.00	18.75	0.00		0.00
6.25	0.00		0.00	19.00	0.00		0.00
6.50	0.00		0.00	19.25	0.00		0.00
6.75	0.00		0.00	19.50	0.00		0.00
7.00	0.00		0.00	19.75	0.00		0.00
7.25	0.00		0.00	20.00	0.00		0.00
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.00		0.00				
12.00	0.00		0.00				
12.25	0.00		0.00				
12.50	0.00		0.00				
12.75	0.00		0.00				
13.00	0.00		0.00				
13.25	0.00		0.00				
13.50	0.00		0.00				
13.75	0.00		0.00				
14.00	0.00		0.00				
14.25	0.00		0.00				
14.50	0.00		0.00				
14.75	0.00		0.00				
15.00	0.00		0.00				
15.25	0.00		0.00				
15.50	0.00		0.00				
15.75	0.00		0.00				
16.00	0.00		0.00				
16.25	0.00		0.00				
16.50	0.00		0.00				

Summary for Pond 5P: Swale1

Inflow Area = 78,408 sf, 0.00% Impervious, Inflow Depth > 0.78" for 10-yr event
Inflow = 1.53 cfs @ 12.16 hrs, Volume= 5,123 cf
Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,664.23' @ 20.00 hrs Surf.Area= 3,693 sf Storage= 5,118 cf

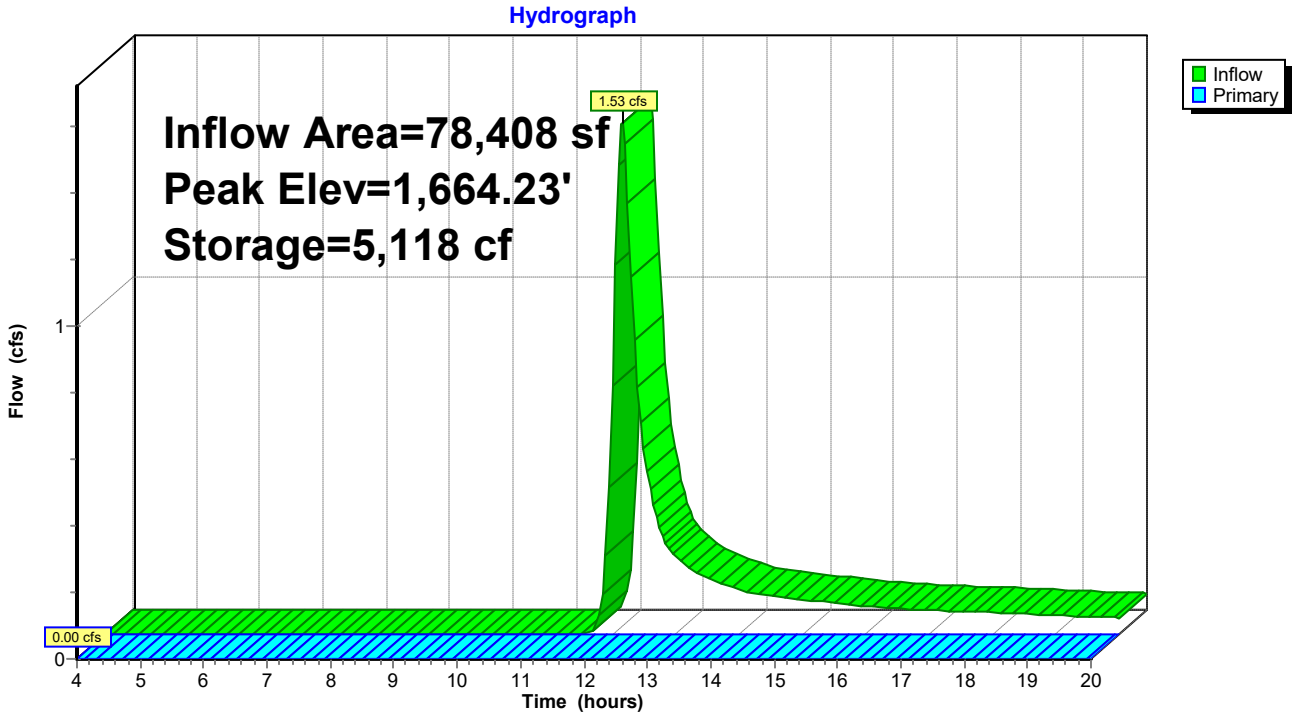
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,662.00'	13,877 cf	**8.00'W x 125.00'L x 4.00'H Prismatoid Z=4.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,665.50'	**180.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 4.00 hrs HW=1,662.00' (Free Discharge)
└**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Swale1



Hydrograph for Pond 5P: Swale1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0	1,662.00	**0.00**
4.50	0.00	0	1,662.00	0.00
5.00	0.00	0	1,662.00	0.00
5.50	0.00	0	1,662.00	0.00
6.00	0.00	0	1,662.00	0.00
6.50	0.00	0	1,662.00	0.00
7.00	0.00	0	1,662.00	0.00
7.50	0.00	0	1,662.00	0.00
8.00	0.00	0	1,662.00	0.00
8.50	0.00	0	1,662.00	0.00
9.00	0.00	0	1,662.00	0.00
9.50	0.00	0	1,662.00	0.00
10.00	0.00	0	1,662.00	0.00
10.50	0.00	0	1,662.00	0.00
11.00	0.00	0	1,662.00	0.00
11.50	0.00	0	1,662.00	0.00
12.00	**0.75**	227	1,662.20	0.00
12.50	**0.55**	2,168	1,663.27	0.00
13.00	0.23	2,790	1,663.51	0.00
13.50	0.17	3,144	1,663.63	0.00
14.00	0.14	3,417	1,663.72	0.00
14.50	0.11	3,639	1,663.80	0.00
15.00	0.10	3,836	1,663.86	0.00
15.50	0.09	4,016	1,663.91	0.00
16.00	0.08	4,177	1,663.96	0.00
16.50	0.08	4,321	1,664.01	0.00
17.00	0.07	4,455	1,664.05	0.00
17.50	0.07	4,583	1,664.08	0.00
18.00	0.07	4,704	1,664.12	0.00
18.50	0.06	4,818	1,664.15	0.00
19.00	0.06	4,926	1,664.18	0.00
19.50	0.05	5,026	1,664.21	0.00
20.00	0.05	**5,119**	**1,664.23**	0.00

Stage-Discharge for Pond 5P: Swale1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,662.00	0.00	1,663.02	0.00	1,664.04	0.00	1,665.06	0.00
1,662.02	0.00	1,663.04	0.00	1,664.06	0.00	1,665.08	0.00
1,662.04	0.00	1,663.06	0.00	1,664.08	0.00	1,665.10	0.00
1,662.06	0.00	1,663.08	0.00	1,664.10	0.00	1,665.12	0.00
1,662.08	0.00	1,663.10	0.00	1,664.12	0.00	1,665.14	0.00
1,662.10	0.00	1,663.12	0.00	1,664.14	0.00	1,665.16	0.00
1,662.12	0.00	1,663.14	0.00	1,664.16	0.00	1,665.18	0.00
1,662.14	0.00	1,663.16	0.00	1,664.18	0.00	1,665.20	0.00
1,662.16	0.00	1,663.18	0.00	1,664.20	0.00	1,665.22	0.00
1,662.18	0.00	1,663.20	0.00	1,664.22	0.00	1,665.24	0.00
1,662.20	0.00	1,663.22	0.00	1,664.24	0.00	1,665.26	0.00
1,662.22	0.00	1,663.24	0.00	1,664.26	0.00	1,665.28	0.00
1,662.24	0.00	1,663.26	0.00	1,664.28	0.00	1,665.30	0.00
1,662.26	0.00	1,663.28	0.00	1,664.30	0.00	1,665.32	0.00
1,662.28	0.00	1,663.30	0.00	1,664.32	0.00	1,665.34	0.00
1,662.30	0.00	1,663.32	0.00	1,664.34	0.00	1,665.36	0.00
1,662.32	0.00	1,663.34	0.00	1,664.36	0.00	1,665.38	0.00
1,662.34	0.00	1,663.36	0.00	1,664.38	0.00	1,665.40	0.00
1,662.36	0.00	1,663.38	0.00	1,664.40	0.00	1,665.42	0.00
1,662.38	0.00	1,663.40	0.00	1,664.42	0.00	1,665.44	0.00
1,662.40	0.00	1,663.42	0.00	1,664.44	0.00	1,665.46	0.00
1,662.42	0.00	1,663.44	0.00	1,664.46	0.00	1,665.48	0.00
1,662.44	0.00	1,663.46	0.00	1,664.48	0.00	1,665.50	0.00
1,662.46	0.00	1,663.48	0.00	1,664.50	0.00	1,665.52	1.66
1,662.48	0.00	1,663.50	0.00	1,664.52	0.00	1,665.54	4.71
1,662.50	0.00	1,663.52	0.00	1,664.54	0.00	1,665.56	8.65
1,662.52	0.00	1,663.54	0.00	1,664.56	0.00	1,665.58	13.32
1,662.54	0.00	1,663.56	0.00	1,664.58	0.00	1,665.60	18.61
1,662.56	0.00	1,663.58	0.00	1,664.60	0.00	1,665.62	24.46
1,662.58	0.00	1,663.60	0.00	1,664.62	0.00	1,665.64	30.83
1,662.60	0.00	1,663.62	0.00	1,664.64	0.00	1,665.66	37.66
1,662.62	0.00	1,663.64	0.00	1,664.66	0.00	1,665.68	44.94
1,662.64	0.00	1,663.66	0.00	1,664.68	0.00	1,665.70	52.63
1,662.66	0.00	1,663.68	0.00	1,664.70	0.00	1,665.72	60.72
1,662.68	0.00	1,663.70	0.00	1,664.72	0.00	1,665.74	69.19
1,662.70	0.00	1,663.72	0.00	1,664.74	0.00	1,665.76	78.01
1,662.72	0.00	1,663.74	0.00	1,664.76	0.00	1,665.78	87.18
1,662.74	0.00	1,663.76	0.00	1,664.78	0.00	1,665.80	96.68
1,662.76	0.00	1,663.78	0.00	1,664.80	0.00	1,665.82	106.51
1,662.78	0.00	1,663.80	0.00	1,664.82	0.00	1,665.84	116.65
1,662.80	0.00	1,663.82	0.00	1,664.84	0.00	1,665.86	127.09
1,662.82	0.00	1,663.84	0.00	1,664.86	0.00	1,665.88	137.82
1,662.84	0.00	1,663.86	0.00	1,664.88	0.00	1,665.90	148.84
1,662.86	0.00	1,663.88	0.00	1,664.90	0.00	1,665.92	160.14
1,662.88	0.00	1,663.90	0.00	1,664.92	0.00	1,665.94	171.71
1,662.90	0.00	1,663.92	0.00	1,664.94	0.00	1,665.96	183.54
1,662.92	0.00	1,663.94	0.00	1,664.96	0.00	1,665.98	195.64
1,662.94	0.00	1,663.96	0.00	1,664.98	0.00	1,666.00	**207.99**
1,662.96	0.00	1,663.98	0.00	1,665.00	0.00		
1,662.98	0.00	1,664.00	0.00	1,665.02	0.00		
1,663.00	0.00	1,664.02	0.00	1,665.04	0.00		

Stage-Area-Storage for Pond 5P: Swale1

Elevation (feet)	Storage (cubic-feet)
1,662.00	0
1,662.05	51
1,662.10	105
1,662.15	162
1,662.20	221
1,662.25	284
1,662.30	348
1,662.35	416
1,662.40	486
1,662.45	560
1,662.50	636
1,662.55	714
1,662.60	796
1,662.65	881
1,662.70	968
1,662.75	1,058
1,662.80	1,151
1,662.85	1,247
1,662.90	1,346
1,662.95	1,448
1,663.00	1,553
1,663.05	1,661
1,663.10	1,772
1,663.15	1,886
1,663.20	2,003
1,663.25	2,123
1,663.30	2,246
1,663.35	2,372
1,663.40	2,501
1,663.45	2,634
1,663.50	2,769
1,663.55	2,908
1,663.60	3,049
1,663.65	3,194
1,663.70	3,342
1,663.75	3,494
1,663.80	3,648
1,663.85	3,806
1,663.90	3,967
1,663.95	4,131
1,664.00	4,299
1,664.05	4,470
1,664.10	4,644
1,664.15	4,821
1,664.20	5,002
1,664.25	5,186
1,664.30	5,374
1,664.35	5,565
1,664.40	5,759
1,664.45	5,957
1,664.50	6,158
1,664.55	6,363
1,664.60	6,571
1,664.65	6,783
1,664.70	6,998
1,664.75	7,217
1,664.80	7,439
1,664.85	7,665
1,664.90	7,894
1,664.95	8,127
1,665.00	8,364
1,665.05	8,604
1,665.10	8,848
1,665.15	9,096
1,665.20	9,347
1,665.25	9,602
1,665.30	9,860
1,665.35	10,122
1,665.40	10,388
1,665.45	10,658
1,665.50	10,932
1,665.55	11,209
1,665.60	11,490
1,665.65	11,775
1,665.70	12,064
1,665.75	12,356
1,665.80	12,653
1,665.85	12,953
1,665.90	13,257
1,665.95	13,565
1,666.00	**13,877**

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area = 91,607 sf, 0.00% Impervious, Inflow Depth > 0.74" for 10-yr event
Inflow = 1.83 cfs @ 12.12 hrs, Volume= 5,630 cf
Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,684.33' @ 20.00 hrs Surf.Area= 0.108 ac Storage= 0.129 af

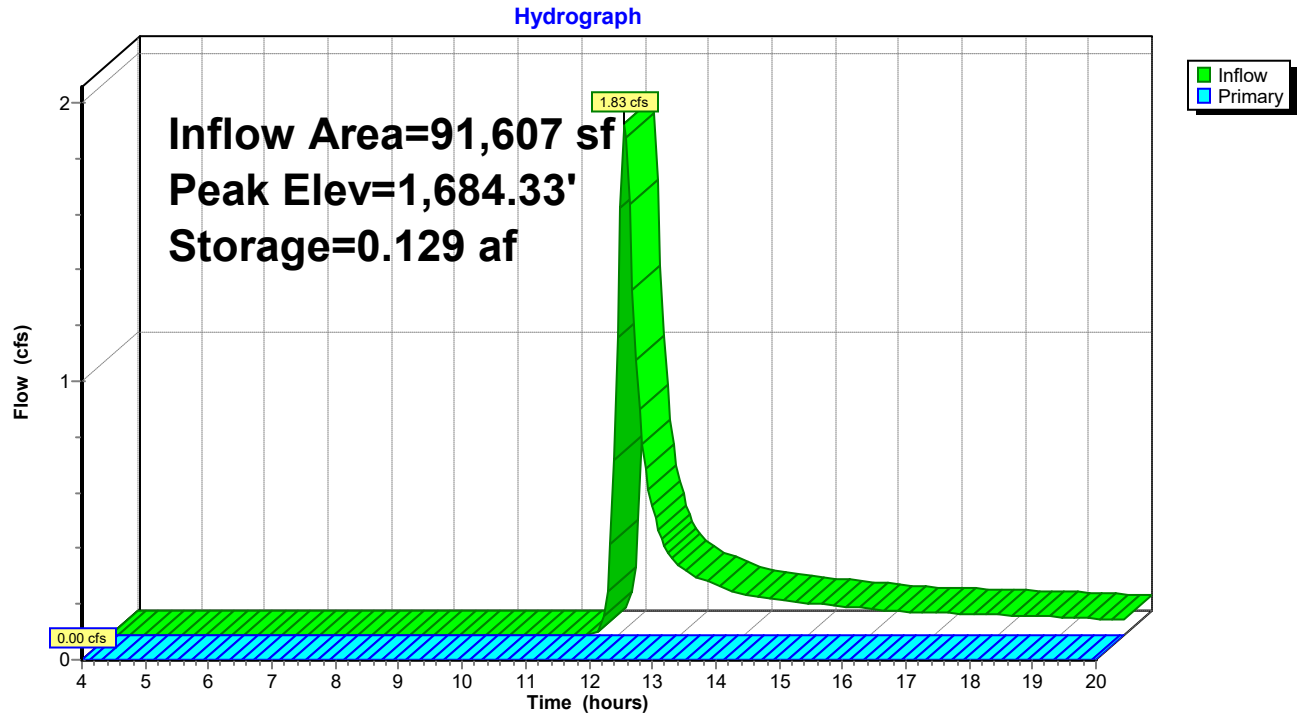
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,683.00'	0.159 af	**25.00'W x 150.00'L x 1.60'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,684.50'	**150.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 4.00 hrs HW=1,683.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0.000	1,683.00	**0.00**
4.50	0.00	0.000	1,683.00	0.00
5.00	0.00	0.000	1,683.00	0.00
5.50	0.00	0.000	1,683.00	0.00
6.00	0.00	0.000	1,683.00	0.00
6.50	0.00	0.000	1,683.00	0.00
7.00	0.00	0.000	1,683.00	0.00
7.50	0.00	0.000	1,683.00	0.00
8.00	0.00	0.000	1,683.00	0.00
8.50	0.00	0.000	1,683.00	0.00
9.00	0.00	0.000	1,683.00	0.00
9.50	0.00	0.000	1,683.00	0.00
10.00	0.00	0.000	1,683.00	0.00
10.50	0.00	0.000	1,683.00	0.00
11.00	0.00	0.000	1,683.00	0.00
11.50	0.00	0.000	1,683.00	0.00
12.00	**1.07**	0.007	1,683.08	0.00
12.50	**0.52**	0.056	1,683.61	0.00
13.00	0.25	0.070	1,683.76	0.00
13.50	0.19	0.079	1,683.85	0.00
14.00	0.15	0.086	1,683.92	0.00
14.50	0.13	0.091	1,683.97	0.00
15.00	0.12	0.096	1,684.02	0.00
15.50	0.11	0.101	1,684.06	0.00
16.00	0.09	0.105	1,684.10	0.00
16.50	0.09	0.109	1,684.14	0.00
17.00	0.08	0.112	1,684.17	0.00
17.50	0.08	0.115	1,684.20	0.00
18.00	0.07	0.118	1,684.23	0.00
18.50	0.07	0.121	1,684.26	0.00
19.00	0.06	0.124	1,684.29	0.00
19.50	0.06	0.127	1,684.31	0.00
20.00	0.06	**0.129**	**1,684.33**	0.00

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,683.00	0.00	1,683.51	0.00	1,684.02	0.00	1,684.53	1.98
1,683.01	0.00	1,683.52	0.00	1,684.03	0.00	1,684.54	3.05
1,683.02	0.00	1,683.53	0.00	1,684.04	0.00	1,684.55	4.26
1,683.03	0.00	1,683.54	0.00	1,684.05	0.00	1,684.56	5.60
1,683.04	0.00	1,683.55	0.00	1,684.06	0.00	1,684.57	7.06
1,683.05	0.00	1,683.56	0.00	1,684.07	0.00	1,684.58	8.62
1,683.06	0.00	1,683.57	0.00	1,684.08	0.00	1,684.59	10.29
1,683.07	0.00	1,683.58	0.00	1,684.09	0.00	1,684.60	**12.05**
1,683.08	0.00	1,683.59	0.00	1,684.10	0.00		
1,683.09	0.00	1,683.60	0.00	1,684.11	0.00		
1,683.10	0.00	1,683.61	0.00	1,684.12	0.00		
1,683.11	0.00	1,683.62	0.00	1,684.13	0.00		
1,683.12	0.00	1,683.63	0.00	1,684.14	0.00		
1,683.13	0.00	1,683.64	0.00	1,684.15	0.00		
1,683.14	0.00	1,683.65	0.00	1,684.16	0.00		
1,683.15	0.00	1,683.66	0.00	1,684.17	0.00		
1,683.16	0.00	1,683.67	0.00	1,684.18	0.00		
1,683.17	0.00	1,683.68	0.00	1,684.19	0.00		
1,683.18	0.00	1,683.69	0.00	1,684.20	0.00		
1,683.19	0.00	1,683.70	0.00	1,684.21	0.00		
1,683.20	0.00	1,683.71	0.00	1,684.22	0.00		
1,683.21	0.00	1,683.72	0.00	1,684.23	0.00		
1,683.22	0.00	1,683.73	0.00	1,684.24	0.00		
1,683.23	0.00	1,683.74	0.00	1,684.25	0.00		
1,683.24	0.00	1,683.75	0.00	1,684.26	0.00		
1,683.25	0.00	1,683.76	0.00	1,684.27	0.00		
1,683.26	0.00	1,683.77	0.00	1,684.28	0.00		
1,683.27	0.00	1,683.78	0.00	1,684.29	0.00		
1,683.28	0.00	1,683.79	0.00	1,684.30	0.00		
1,683.29	0.00	1,683.80	0.00	1,684.31	0.00		
1,683.30	0.00	1,683.81	0.00	1,684.32	0.00		
1,683.31	0.00	1,683.82	0.00	1,684.33	0.00		
1,683.32	0.00	1,683.83	0.00	1,684.34	0.00		
1,683.33	0.00	1,683.84	0.00	1,684.35	0.00		
1,683.34	0.00	1,683.85	0.00	1,684.36	0.00		
1,683.35	0.00	1,683.86	0.00	1,684.37	0.00		
1,683.36	0.00	1,683.87	0.00	1,684.38	0.00		
1,683.37	0.00	1,683.88	0.00	1,684.39	0.00		
1,683.38	0.00	1,683.89	0.00	1,684.40	0.00		
1,683.39	0.00	1,683.90	0.00	1,684.41	0.00		
1,683.40	0.00	1,683.91	0.00	1,684.42	0.00		
1,683.41	0.00	1,683.92	0.00	1,684.43	0.00		
1,683.42	0.00	1,683.93	0.00	1,684.44	0.00		
1,683.43	0.00	1,683.94	0.00	1,684.45	0.00		
1,683.44	0.00	1,683.95	0.00	1,684.46	0.00		
1,683.45	0.00	1,683.96	0.00	1,684.47	0.00		
1,683.46	0.00	1,683.97	0.00	1,684.48	0.00		
1,683.47	0.00	1,683.98	0.00	1,684.49	0.00		
1,683.48	0.00	1,683.99	0.00	1,684.50	0.00		
1,683.49	0.00	1,684.00	0.00	1,684.51	0.38		
1,683.50	0.00	1,684.01	0.00	1,684.52	1.08		

Stage-Area-Storage for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Storage (acre-feet)
1,683.00	0.000
1,683.02	0.002
1,683.04	0.003
1,683.06	0.005
1,683.08	0.007
1,683.10	0.009
1,683.12	0.010
1,683.14	0.012
1,683.16	0.014
1,683.18	0.016
1,683.20	0.018
1,683.22	0.019
1,683.24	0.021
1,683.26	0.023
1,683.28	0.025
1,683.30	0.027
1,683.32	0.028
1,683.34	0.030
1,683.36	0.032
1,683.38	0.034
1,683.40	0.036
1,683.42	0.038
1,683.44	0.039
1,683.46	0.041
1,683.48	0.043
1,683.50	0.045
1,683.52	0.047
1,683.54	0.049
1,683.56	0.051
1,683.58	0.053
1,683.60	0.055
1,683.62	0.056
1,683.64	0.058
1,683.66	0.060
1,683.68	0.062
1,683.70	0.064
1,683.72	0.066
1,683.74	0.068
1,683.76	0.070
1,683.78	0.072
1,683.80	0.074
1,683.82	0.076
1,683.84	0.078
1,683.86	0.080
1,683.88	0.082
1,683.90	0.084
1,683.92	0.086
1,683.94	0.088
1,683.96	0.090
1,683.98	0.092
1,684.00	0.094
1,684.02	0.096
1,684.04	0.098
1,684.06	0.100
1,684.08	0.103
1,684.10	0.105
1,684.12	0.107
1,684.14	0.109
1,684.16	0.111
1,684.18	0.113
1,684.20	0.115
1,684.22	0.117
1,684.24	0.119
1,684.26	0.121
1,684.28	0.124
1,684.30	0.126
1,684.32	0.128
1,684.34	0.130
1,684.36	0.132
1,684.38	0.134
1,684.40	0.137
1,684.42	0.139
1,684.44	0.141
1,684.46	0.143
1,684.48	0.145
1,684.50	0.148
1,684.52	0.150
1,684.54	0.152
1,684.56	0.154
1,684.58	0.157
1,684.60	**0.159**

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>1.17"
Flow Length=861' Tc=20.5 min CN=66 Runoff=2.39 cfs 7,623 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>1.11"
Flow Length=471' Tc=17.4 min CN=65 Runoff=2.90 cfs 8,463 cf

Reach 14R: Post w/ BMP Inflow=0.16 cfs 2,017 cf
Outflow=0.16 cfs 2,017 cf

Pond 5P: Swale1 Peak Elev=1,664.84' Storage=7,617 cf Inflow=2.39 cfs 7,623 cf
Outflow=0.00 cfs 0 cf

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,684.51' Storage=0.148 af Inflow=2.90 cfs 8,463 cf
Outflow=0.16 cfs 2,017 cf

Total Runoff Area = 170,015 sf Runoff Volume = 16,086 cf Average Runoff Depth = 1.14"
100.00% Pervious = 170,015 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

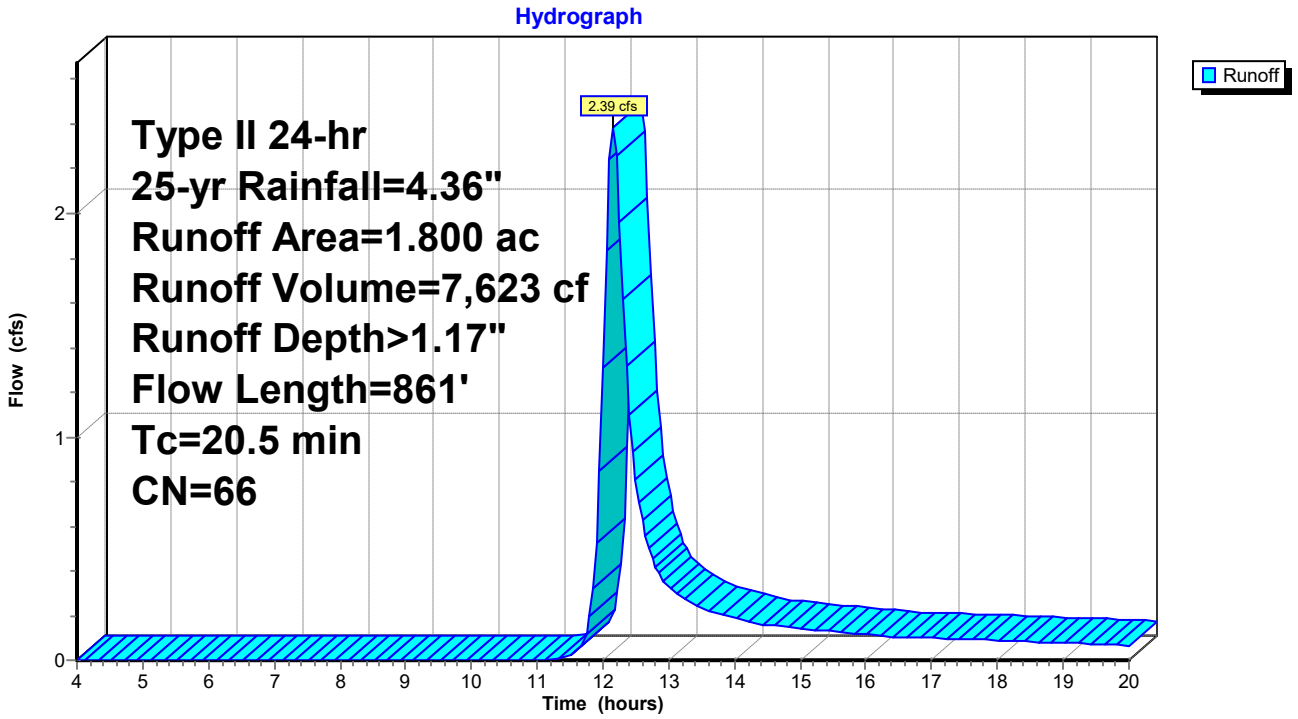
Runoff = 2.39 cfs @ 12.15 hrs, Volume= 7,623 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.21	0.00	0.00
4.25	0.22	0.00	0.00
4.50	0.24	0.00	0.00
4.75	0.26	0.00	0.00
5.00	0.27	0.00	0.00
5.25	0.29	0.00	0.00
5.50	0.31	0.00	0.00
5.75	0.33	0.00	0.00
6.00	0.35	0.00	0.00
6.25	0.37	0.00	0.00
6.50	0.39	0.00	0.00
6.75	0.41	0.00	0.00
7.00	0.43	0.00	0.00
7.25	0.45	0.00	0.00
7.50	0.48	0.00	0.00
7.75	0.50	0.00	0.00
8.00	0.52	0.00	0.00
8.25	0.55	0.00	0.00
8.50	0.58	0.00	0.00
8.75	0.61	0.00	0.00
9.00	0.64	0.00	0.00
9.25	0.68	0.00	0.00
9.50	0.71	0.00	0.00
9.75	0.75	0.00	0.00
10.00	0.79	0.00	0.00
10.25	0.84	0.00	0.00
10.50	0.89	0.00	0.00
10.75	0.95	0.00	0.00
11.00	1.02	0.00	0.00
11.25	1.12	0.00	0.00
11.50	1.23	0.01	0.02
11.75	1.69	0.07	0.12
12.00	2.89	0.49	**1.31**
12.25	3.08	0.58	**1.96**
12.50	3.20	0.65	0.81
12.75	3.29	0.69	0.46
13.00	3.37	0.73	0.33
13.25	3.43	0.76	0.27
13.50	3.48	0.79	0.24
13.75	3.53	0.82	0.21
14.00	3.58	0.84	0.19
14.25	3.61	0.86	0.17
14.50	3.65	0.88	0.16
14.75	3.69	0.90	0.15
15.00	3.72	0.92	0.14
15.25	3.75	0.94	0.14
15.50	3.78	0.96	0.13
15.75	3.81	0.97	0.12
16.00	3.84	0.99	0.12
16.25	3.86	1.00	0.11
16.50	3.89	1.02	0.10
16.75	3.91	1.03	0.10
17.00	3.93	1.05	0.10
17.25	3.95	1.06	0.10
17.50	3.97	1.07	0.09
17.75	4.00	1.08	0.09
18.00	4.02	1.10	0.09
18.25	4.03	1.11	0.09
18.50	4.05	1.12	0.08
18.75	4.07	1.13	0.08
19.00	4.09	1.14	0.08
19.25	4.11	1.15	0.08
19.50	4.12	1.16	0.07
19.75	4.14	1.17	0.07
20.00	**4.15**	**1.18**	0.07

Summary for Subcatchment 7S: DA-2

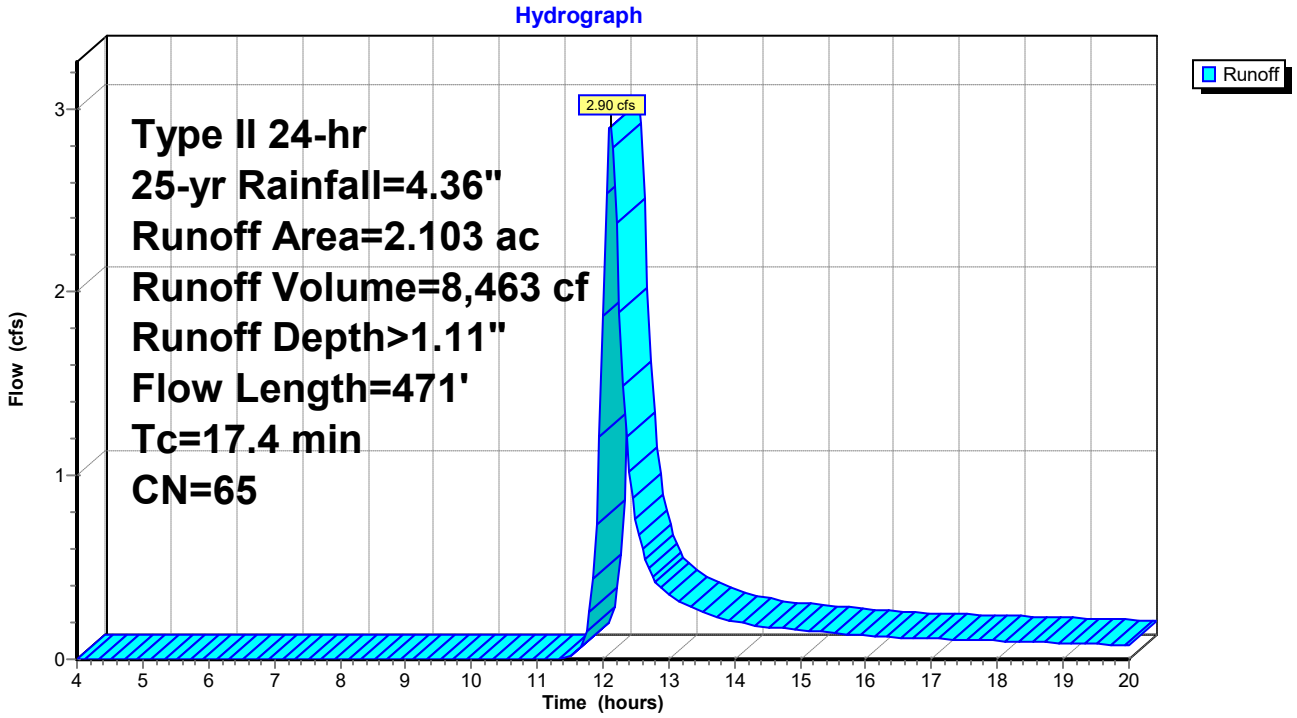
Runoff = 2.90 cfs @ 12.11 hrs, Volume= 8,463 cf, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

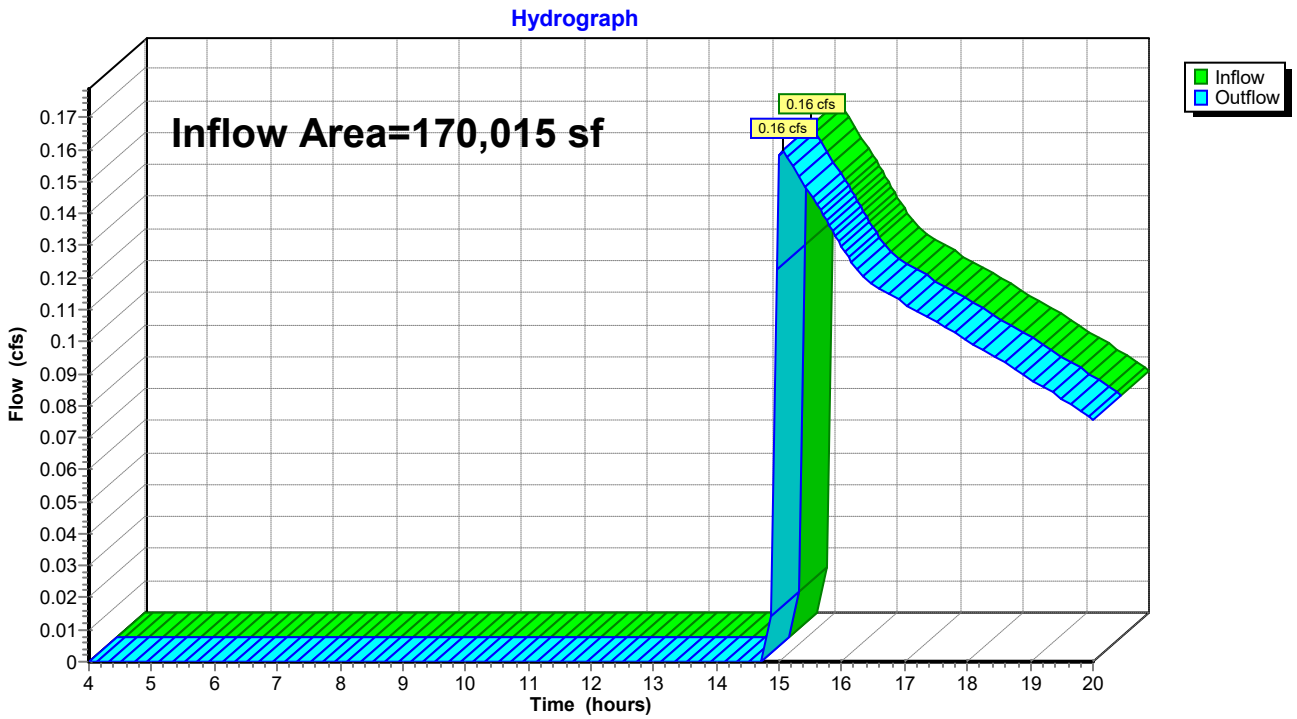
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.21	0.00	0.00
4.25	0.22	0.00	0.00
4.50	0.24	0.00	0.00
4.75	0.26	0.00	0.00
5.00	0.27	0.00	0.00
5.25	0.29	0.00	0.00
5.50	0.31	0.00	0.00
5.75	0.33	0.00	0.00
6.00	0.35	0.00	0.00
6.25	0.37	0.00	0.00
6.50	0.39	0.00	0.00
6.75	0.41	0.00	0.00
7.00	0.43	0.00	0.00
7.25	0.45	0.00	0.00
7.50	0.48	0.00	0.00
7.75	0.50	0.00	0.00
8.00	0.52	0.00	0.00
8.25	0.55	0.00	0.00
8.50	0.58	0.00	0.00
8.75	0.61	0.00	0.00
9.00	0.64	0.00	0.00
9.25	0.68	0.00	0.00
9.50	0.71	0.00	0.00
9.75	0.75	0.00	0.00
10.00	0.79	0.00	0.00
10.25	0.84	0.00	0.00
10.50	0.89	0.00	0.00
10.75	0.95	0.00	0.00
11.00	1.02	0.00	0.00
11.25	1.12	0.00	0.00
11.50	1.23	0.00	0.01
11.75	1.69	0.06	0.15
12.00	2.89	0.46	**1.87**
12.25	3.08	0.54	**1.89**
12.50	3.20	0.60	0.76
12.75	3.29	0.65	0.45
13.00	3.37	0.68	0.35
13.25	3.43	0.71	0.29
13.50	3.48	0.74	0.26
13.75	3.53	0.77	0.23
14.00	3.58	0.79	0.21
14.25	3.61	0.81	0.19
14.50	3.65	0.83	0.18
14.75	3.69	0.85	0.17
15.00	3.72	0.87	0.16
15.25	3.75	0.89	0.15
15.50	3.78	0.91	0.15
15.75	3.81	0.92	0.14
16.00	3.84	0.94	0.13
16.25	3.86	0.95	0.12
16.50	3.89	0.96	0.12
16.75	3.91	0.98	0.11
17.00	3.93	0.99	0.11
17.25	3.95	1.00	0.11
17.50	3.97	1.01	0.11
17.75	4.00	1.03	0.10
18.00	4.02	1.04	0.10
18.25	4.03	1.05	0.10
18.50	4.05	1.06	0.09
18.75	4.07	1.07	0.09
19.00	4.09	1.08	0.09
19.25	4.11	1.09	0.08
19.50	4.12	1.10	0.08
19.75	4.14	1.11	0.08
20.00	**4.15**	**1.12**	0.07

Summary for Reach 14R: Post w/ BMP

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 0.14" for 25-yr event
Inflow = 0.16 cfs @ 15.05 hrs, Volume= 2,017 cf
Outflow = 0.16 cfs @ 15.05 hrs, Volume= 2,017 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post w/ BMP



Hydrograph for Reach 14R: Post w/ BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00
4.25	0.00		0.00
4.50	0.00		0.00
4.75	0.00		0.00
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.00		0.00
8.50	0.00		0.00
8.75	0.00		0.00
9.00	0.00		0.00
9.25	0.00		0.00
9.50	0.00		0.00
9.75	0.00		0.00
10.00	0.00		0.00
10.25	0.00		0.00
10.50	0.00		0.00
10.75	0.00		0.00
11.00	0.00		0.00
11.25	0.00		0.00
11.50	0.00		0.00
11.75	0.00		0.00
12.00	0.00		0.00
12.25	0.00		0.00
12.50	0.00		0.00
12.75	0.00		0.00
13.00	0.00		0.00
13.25	0.00		0.00
13.50	0.00		0.00
13.75	0.00		0.00
14.00	0.00		0.00
14.25	0.00		0.00
14.50	0.00		0.00
14.75	0.00		0.00
15.00	**0.16**		**0.16**
15.25	**0.15**		**0.15**
15.50	0.15		0.15
15.75	0.14		0.14
16.00	0.13		0.13
16.25	0.12		0.12
16.50	0.12		0.12
16.75	0.11		0.11
17.00	0.11		0.11
17.25	0.11		0.11
17.50	0.11		0.11
17.75	0.10		0.10
18.00	0.10		0.10
18.25	0.10		0.10
18.50	0.09		0.09
18.75	0.09		0.09
19.00	0.09		0.09
19.25	0.09		0.09
19.50	0.08		0.08
19.75	0.08		0.08
20.00	0.08		0.08

Summary for Pond 5P: Swale1

Inflow Area = 78,408 sf, 0.00% Impervious, Inflow Depth > 1.17" for 25-yr event
Inflow = 2.39 cfs @ 12.15 hrs, Volume= 7,623 cf
Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,664.84' @ 20.00 hrs Surf.Area= 4,537 sf Storage= 7,617 cf

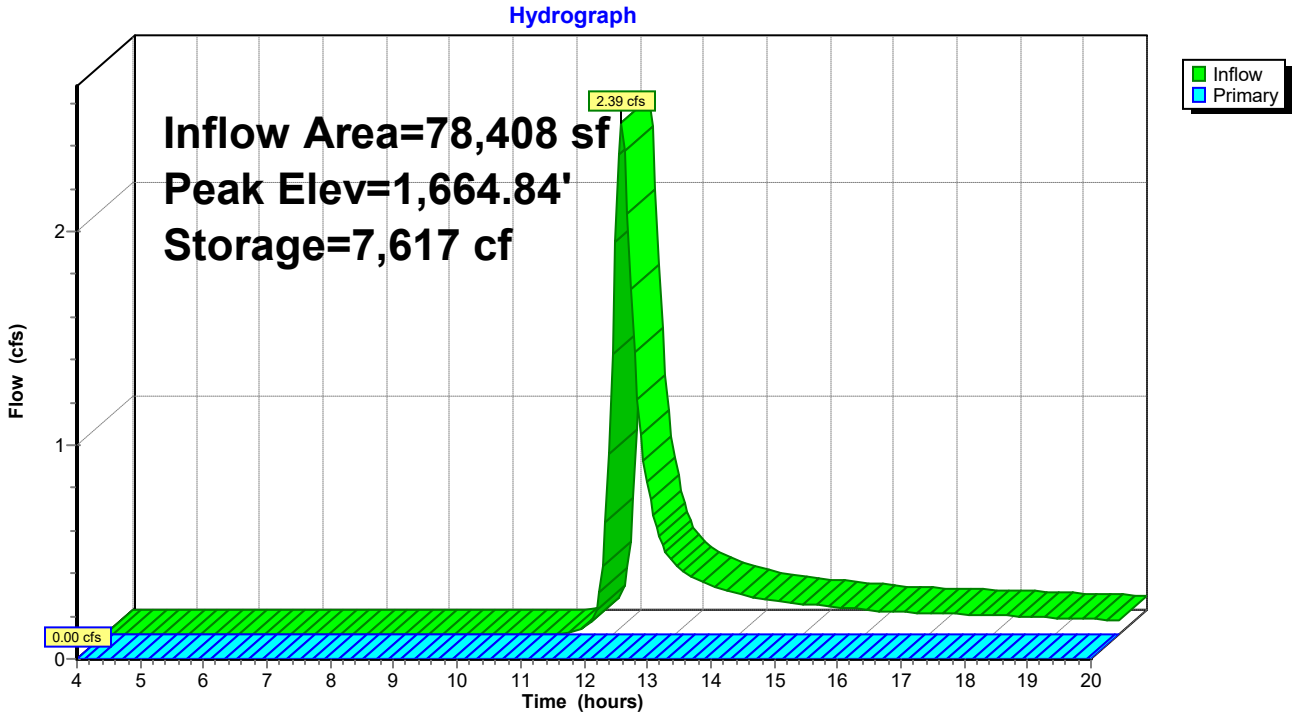
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,662.00'	13,877 cf	**8.00'W x 125.00'L x 4.00'H Prismatoid Z=4.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,665.50'	**180.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 4.00 hrs HW=1,662.00' (Free Discharge)
└**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Swale1



Hydrograph for Pond 5P: Swale1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0	1,662.00	**0.00**
4.50	0.00	0	1,662.00	0.00
5.00	0.00	0	1,662.00	0.00
5.50	0.00	0	1,662.00	0.00
6.00	0.00	0	1,662.00	0.00
6.50	0.00	0	1,662.00	0.00
7.00	0.00	0	1,662.00	0.00
7.50	0.00	0	1,662.00	0.00
8.00	0.00	0	1,662.00	0.00
8.50	0.00	0	1,662.00	0.00
9.00	0.00	0	1,662.00	0.00
9.50	0.00	0	1,662.00	0.00
10.00	0.00	0	1,662.00	0.00
10.50	0.00	0	1,662.00	0.00
11.00	0.00	0	1,662.00	0.00
11.50	0.02	8	1,662.01	0.00
12.00	**1.31**	521	1,662.42	0.00
12.50	**0.81**	3,533	1,663.76	0.00
13.00	0.33	4,422	1,664.04	0.00
13.50	0.24	4,917	1,664.18	0.00
14.00	0.19	5,296	1,664.28	0.00
14.50	0.16	5,602	1,664.36	0.00
15.00	0.14	5,873	1,664.43	0.00
15.50	0.13	6,119	1,664.49	0.00
16.00	0.12	6,340	1,664.54	0.00
16.50	0.10	6,536	1,664.59	0.00
17.00	0.10	6,718	1,664.63	0.00
17.50	0.09	6,892	1,664.68	0.00
18.00	0.09	7,057	1,664.71	0.00
18.50	0.08	7,211	1,664.75	0.00
19.00	0.08	7,357	1,664.78	0.00
19.50	0.07	7,492	1,664.81	0.00
20.00	0.07	**7,617**	**1,664.84**	0.00

Stage-Discharge for Pond 5P: Swale1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,662.00	0.00	1,663.02	0.00	1,664.04	0.00	1,665.06	0.00
1,662.02	0.00	1,663.04	0.00	1,664.06	0.00	1,665.08	0.00
1,662.04	0.00	1,663.06	0.00	1,664.08	0.00	1,665.10	0.00
1,662.06	0.00	1,663.08	0.00	1,664.10	0.00	1,665.12	0.00
1,662.08	0.00	1,663.10	0.00	1,664.12	0.00	1,665.14	0.00
1,662.10	0.00	1,663.12	0.00	1,664.14	0.00	1,665.16	0.00
1,662.12	0.00	1,663.14	0.00	1,664.16	0.00	1,665.18	0.00
1,662.14	0.00	1,663.16	0.00	1,664.18	0.00	1,665.20	0.00
1,662.16	0.00	1,663.18	0.00	1,664.20	0.00	1,665.22	0.00
1,662.18	0.00	1,663.20	0.00	1,664.22	0.00	1,665.24	0.00
1,662.20	0.00	1,663.22	0.00	1,664.24	0.00	1,665.26	0.00
1,662.22	0.00	1,663.24	0.00	1,664.26	0.00	1,665.28	0.00
1,662.24	0.00	1,663.26	0.00	1,664.28	0.00	1,665.30	0.00
1,662.26	0.00	1,663.28	0.00	1,664.30	0.00	1,665.32	0.00
1,662.28	0.00	1,663.30	0.00	1,664.32	0.00	1,665.34	0.00
1,662.30	0.00	1,663.32	0.00	1,664.34	0.00	1,665.36	0.00
1,662.32	0.00	1,663.34	0.00	1,664.36	0.00	1,665.38	0.00
1,662.34	0.00	1,663.36	0.00	1,664.38	0.00	1,665.40	0.00
1,662.36	0.00	1,663.38	0.00	1,664.40	0.00	1,665.42	0.00
1,662.38	0.00	1,663.40	0.00	1,664.42	0.00	1,665.44	0.00
1,662.40	0.00	1,663.42	0.00	1,664.44	0.00	1,665.46	0.00
1,662.42	0.00	1,663.44	0.00	1,664.46	0.00	1,665.48	0.00
1,662.44	0.00	1,663.46	0.00	1,664.48	0.00	1,665.50	0.00
1,662.46	0.00	1,663.48	0.00	1,664.50	0.00	1,665.52	1.66
1,662.48	0.00	1,663.50	0.00	1,664.52	0.00	1,665.54	4.71
1,662.50	0.00	1,663.52	0.00	1,664.54	0.00	1,665.56	8.65
1,662.52	0.00	1,663.54	0.00	1,664.56	0.00	1,665.58	13.32
1,662.54	0.00	1,663.56	0.00	1,664.58	0.00	1,665.60	18.61
1,662.56	0.00	1,663.58	0.00	1,664.60	0.00	1,665.62	24.46
1,662.58	0.00	1,663.60	0.00	1,664.62	0.00	1,665.64	30.83
1,662.60	0.00	1,663.62	0.00	1,664.64	0.00	1,665.66	37.66
1,662.62	0.00	1,663.64	0.00	1,664.66	0.00	1,665.68	44.94
1,662.64	0.00	1,663.66	0.00	1,664.68	0.00	1,665.70	52.63
1,662.66	0.00	1,663.68	0.00	1,664.70	0.00	1,665.72	60.72
1,662.68	0.00	1,663.70	0.00	1,664.72	0.00	1,665.74	69.19
1,662.70	0.00	1,663.72	0.00	1,664.74	0.00	1,665.76	78.01
1,662.72	0.00	1,663.74	0.00	1,664.76	0.00	1,665.78	87.18
1,662.74	0.00	1,663.76	0.00	1,664.78	0.00	1,665.80	96.68
1,662.76	0.00	1,663.78	0.00	1,664.80	0.00	1,665.82	106.51
1,662.78	0.00	1,663.80	0.00	1,664.82	0.00	1,665.84	116.65
1,662.80	0.00	1,663.82	0.00	1,664.84	0.00	1,665.86	127.09
1,662.82	0.00	1,663.84	0.00	1,664.86	0.00	1,665.88	137.82
1,662.84	0.00	1,663.86	0.00	1,664.88	0.00	1,665.90	148.84
1,662.86	0.00	1,663.88	0.00	1,664.90	0.00	1,665.92	160.14
1,662.88	0.00	1,663.90	0.00	1,664.92	0.00	1,665.94	171.71
1,662.90	0.00	1,663.92	0.00	1,664.94	0.00	1,665.96	183.54
1,662.92	0.00	1,663.94	0.00	1,664.96	0.00	1,665.98	195.64
1,662.94	0.00	1,663.96	0.00	1,664.98	0.00	1,666.00	**207.99**
1,662.96	0.00	1,663.98	0.00	1,665.00	0.00		
1,662.98	0.00	1,664.00	0.00	1,665.02	0.00		
1,663.00	0.00	1,664.02	0.00	1,665.04	0.00		

Stage-Area-Storage for Pond 5P: Swale1

Elevation (feet)	Storage (cubic-feet)
1,662.00	0
1,662.05	51
1,662.10	105
1,662.15	162
1,662.20	221
1,662.25	284
1,662.30	348
1,662.35	416
1,662.40	486
1,662.45	560
1,662.50	636
1,662.55	714
1,662.60	796
1,662.65	881
1,662.70	968
1,662.75	1,058
1,662.80	1,151
1,662.85	1,247
1,662.90	1,346
1,662.95	1,448
1,663.00	1,553
1,663.05	1,661
1,663.10	1,772
1,663.15	1,886
1,663.20	2,003
1,663.25	2,123
1,663.30	2,246
1,663.35	2,372
1,663.40	2,501
1,663.45	2,634
1,663.50	2,769
1,663.55	2,908
1,663.60	3,049
1,663.65	3,194
1,663.70	3,342
1,663.75	3,494
1,663.80	3,648
1,663.85	3,806
1,663.90	3,967
1,663.95	4,131
1,664.00	4,299
1,664.05	4,470
1,664.10	4,644
1,664.15	4,821
1,664.20	5,002
1,664.25	5,186
1,664.30	5,374
1,664.35	5,565
1,664.40	5,759
1,664.45	5,957
1,664.50	6,158
1,664.55	6,363
1,664.60	6,571
1,664.65	6,783
1,664.70	6,998
1,664.75	7,217
1,664.80	7,439
1,664.85	7,665
1,664.90	7,894
1,664.95	8,127
1,665.00	8,364
1,665.05	8,604
1,665.10	8,848
1,665.15	9,096
1,665.20	9,347
1,665.25	9,602
1,665.30	9,860
1,665.35	10,122
1,665.40	10,388
1,665.45	10,658
1,665.50	10,932
1,665.55	11,209
1,665.60	11,490
1,665.65	11,775
1,665.70	12,064
1,665.75	12,356
1,665.80	12,653
1,665.85	12,953
1,665.90	13,257
1,665.95	13,565
1,666.00	**13,877**

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area =	91,607 sf,	0.00% Impervious,	Inflow Depth >	1.11"	for 25-yr event
Inflow =	2.90 cfs @	12.11 hrs,	Volume=	8,463 cf	
Outflow =	0.16 cfs @	15.05 hrs,	Volume=	2,017 cf,	Atten= 94%, Lag= 176.4 min
Primary =	0.16 cfs @	15.05 hrs,	Volume=	2,017 cf	

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,684.51' @ 15.05 hrs Surf.Area= 0.111 ac Storage= 0.148 af

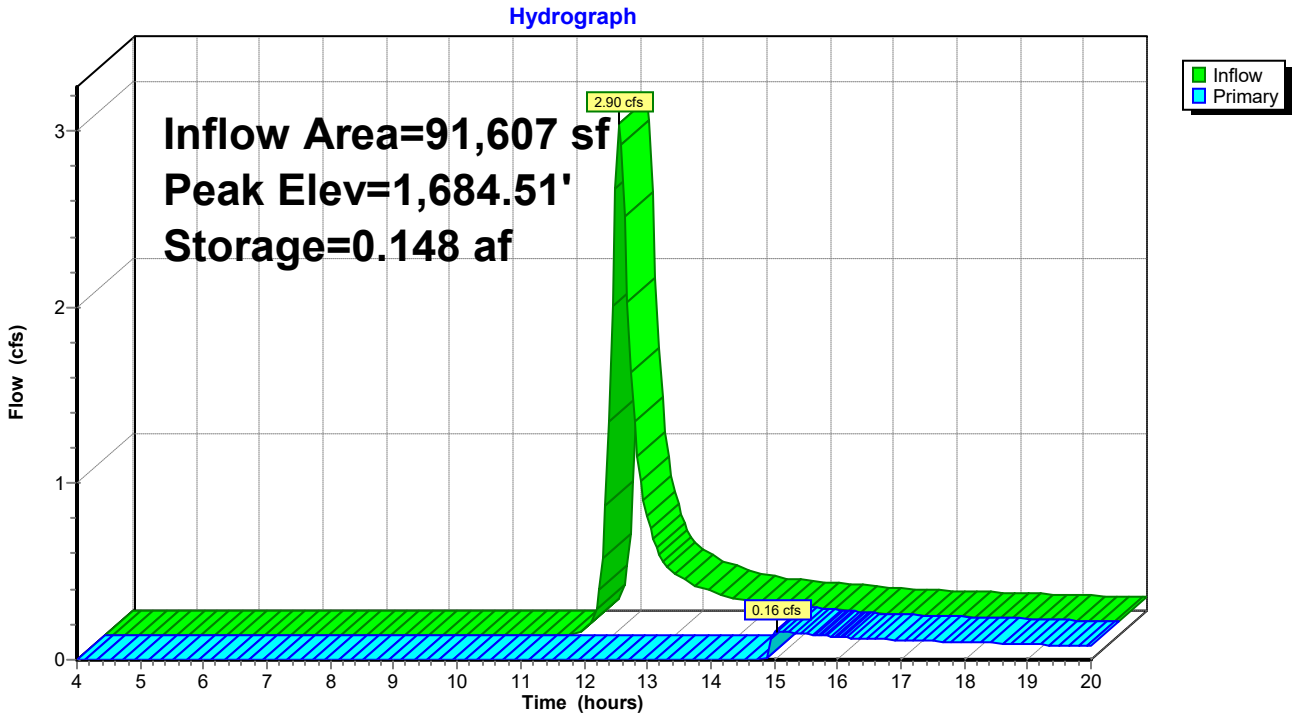
Plug-Flow detention time= 309.2 min calculated for 2,017 cf (24% of inflow)
Center-of-Mass det. time= 207.8 min (1,030.4 - 822.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,683.00'	0.159 af	**25.00'W x 150.00'L x 1.60'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,684.50'	**150.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.14 cfs @ 15.05 hrs HW=1,684.51' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 0.14 cfs @ 0.18 fps)

Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0.000	1,683.00	0.00
4.50	0.00	0.000	1,683.00	0.00
5.00	0.00	0.000	1,683.00	0.00
5.50	0.00	0.000	1,683.00	0.00
6.00	0.00	0.000	1,683.00	0.00
6.50	0.00	0.000	1,683.00	0.00
7.00	0.00	0.000	1,683.00	0.00
7.50	0.00	0.000	1,683.00	0.00
8.00	0.00	0.000	1,683.00	0.00
8.50	0.00	0.000	1,683.00	0.00
9.00	0.00	0.000	1,683.00	0.00
9.50	0.00	0.000	1,683.00	0.00
10.00	0.00	0.000	1,683.00	0.00
10.50	0.00	0.000	1,683.00	0.00
11.00	0.00	0.000	1,683.00	0.00
11.50	0.01	0.000	1,683.00	0.00
12.00	**1.87**	0.016	1,683.19	0.00
12.50	**0.76**	0.092	1,683.98	0.00
13.00	0.35	0.112	1,684.18	0.00
13.50	0.26	0.125	1,684.29	0.00
14.00	0.21	0.134	1,684.38	0.00
14.50	0.18	0.142	1,684.45	0.00
15.00	0.16	**0.148**	**1,684.51**	**0.16**
15.50	0.15	**0.148**	**1,684.50**	**0.15**
16.00	0.13	0.148	1,684.50	0.13
16.50	0.12	0.148	1,684.50	0.12
17.00	0.11	0.148	1,684.50	0.11
17.50	0.11	0.148	1,684.50	0.11
18.00	0.10	0.148	1,684.50	0.10
18.50	0.09	0.148	1,684.50	0.09
19.00	0.09	0.148	1,684.50	0.09
19.50	0.08	0.148	1,684.50	0.08
20.00	0.07	0.148	1,684.50	0.08

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,683.00	0.00	1,683.51	0.00	1,684.02	0.00	1,684.53	1.98
1,683.01	0.00	1,683.52	0.00	1,684.03	0.00	1,684.54	3.05
1,683.02	0.00	1,683.53	0.00	1,684.04	0.00	1,684.55	4.26
1,683.03	0.00	1,683.54	0.00	1,684.05	0.00	1,684.56	5.60
1,683.04	0.00	1,683.55	0.00	1,684.06	0.00	1,684.57	7.06
1,683.05	0.00	1,683.56	0.00	1,684.07	0.00	1,684.58	8.62
1,683.06	0.00	1,683.57	0.00	1,684.08	0.00	1,684.59	10.29
1,683.07	0.00	1,683.58	0.00	1,684.09	0.00	1,684.60	**12.05**
1,683.08	0.00	1,683.59	0.00	1,684.10	0.00		
1,683.09	0.00	1,683.60	0.00	1,684.11	0.00		
1,683.10	0.00	1,683.61	0.00	1,684.12	0.00		
1,683.11	0.00	1,683.62	0.00	1,684.13	0.00		
1,683.12	0.00	1,683.63	0.00	1,684.14	0.00		
1,683.13	0.00	1,683.64	0.00	1,684.15	0.00		
1,683.14	0.00	1,683.65	0.00	1,684.16	0.00		
1,683.15	0.00	1,683.66	0.00	1,684.17	0.00		
1,683.16	0.00	1,683.67	0.00	1,684.18	0.00		
1,683.17	0.00	1,683.68	0.00	1,684.19	0.00		
1,683.18	0.00	1,683.69	0.00	1,684.20	0.00		
1,683.19	0.00	1,683.70	0.00	1,684.21	0.00		
1,683.20	0.00	1,683.71	0.00	1,684.22	0.00		
1,683.21	0.00	1,683.72	0.00	1,684.23	0.00		
1,683.22	0.00	1,683.73	0.00	1,684.24	0.00		
1,683.23	0.00	1,683.74	0.00	1,684.25	0.00		
1,683.24	0.00	1,683.75	0.00	1,684.26	0.00		
1,683.25	0.00	1,683.76	0.00	1,684.27	0.00		
1,683.26	0.00	1,683.77	0.00	1,684.28	0.00		
1,683.27	0.00	1,683.78	0.00	1,684.29	0.00		
1,683.28	0.00	1,683.79	0.00	1,684.30	0.00		
1,683.29	0.00	1,683.80	0.00	1,684.31	0.00		
1,683.30	0.00	1,683.81	0.00	1,684.32	0.00		
1,683.31	0.00	1,683.82	0.00	1,684.33	0.00		
1,683.32	0.00	1,683.83	0.00	1,684.34	0.00		
1,683.33	0.00	1,683.84	0.00	1,684.35	0.00		
1,683.34	0.00	1,683.85	0.00	1,684.36	0.00		
1,683.35	0.00	1,683.86	0.00	1,684.37	0.00		
1,683.36	0.00	1,683.87	0.00	1,684.38	0.00		
1,683.37	0.00	1,683.88	0.00	1,684.39	0.00		
1,683.38	0.00	1,683.89	0.00	1,684.40	0.00		
1,683.39	0.00	1,683.90	0.00	1,684.41	0.00		
1,683.40	0.00	1,683.91	0.00	1,684.42	0.00		
1,683.41	0.00	1,683.92	0.00	1,684.43	0.00		
1,683.42	0.00	1,683.93	0.00	1,684.44	0.00		
1,683.43	0.00	1,683.94	0.00	1,684.45	0.00		
1,683.44	0.00	1,683.95	0.00	1,684.46	0.00		
1,683.45	0.00	1,683.96	0.00	1,684.47	0.00		
1,683.46	0.00	1,683.97	0.00	1,684.48	0.00		
1,683.47	0.00	1,683.98	0.00	1,684.49	0.00		
1,683.48	0.00	1,683.99	0.00	1,684.50	0.00		
1,683.49	0.00	1,684.00	0.00	1,684.51	0.38		
1,683.50	0.00	1,684.01	0.00	1,684.52	1.08		

Stage-Area-Storage for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Storage (acre-feet)
1,683.00	0.000
1,683.02	0.002
1,683.04	0.003
1,683.06	0.005
1,683.08	0.007
1,683.10	0.009
1,683.12	0.010
1,683.14	0.012
1,683.16	0.014
1,683.18	0.016
1,683.20	0.018
1,683.22	0.019
1,683.24	0.021
1,683.26	0.023
1,683.28	0.025
1,683.30	0.027
1,683.32	0.028
1,683.34	0.030
1,683.36	0.032
1,683.38	0.034
1,683.40	0.036
1,683.42	0.038
1,683.44	0.039
1,683.46	0.041
1,683.48	0.043
1,683.50	0.045
1,683.52	0.047
1,683.54	0.049
1,683.56	0.051
1,683.58	0.053
1,683.60	0.055
1,683.62	0.056
1,683.64	0.058
1,683.66	0.060
1,683.68	0.062
1,683.70	0.064
1,683.72	0.066
1,683.74	0.068
1,683.76	0.070
1,683.78	0.072
1,683.80	0.074
1,683.82	0.076
1,683.84	0.078
1,683.86	0.080
1,683.88	0.082
1,683.90	0.084
1,683.92	0.086
1,683.94	0.088
1,683.96	0.090
1,683.98	0.092
1,684.00	0.094
1,684.02	0.096
1,684.04	0.098
1,684.06	0.100
1,684.08	0.103
1,684.10	0.105
1,684.12	0.107
1,684.14	0.109
1,684.16	0.111
1,684.18	0.113
1,684.20	0.115
1,684.22	0.117
1,684.24	0.119
1,684.26	0.121
1,684.28	0.124
1,684.30	0.126
1,684.32	0.128
1,684.34	0.130
1,684.36	0.132
1,684.38	0.134
1,684.40	0.137
1,684.42	0.139
1,684.44	0.141
1,684.46	0.143
1,684.48	0.145
1,684.50	0.148
1,684.52	0.150
1,684.54	0.152
1,684.56	0.154
1,684.58	0.157
1,684.60	**0.159**

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>1.53"
Flow Length=861' Tc=20.5 min CN=66 Runoff=3.20 cfs 9,985 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>1.46"
Flow Length=471' Tc=17.4 min CN=65 Runoff=3.91 cfs 11,153 cf

Reach 14R: Post w/ BMP Inflow=0.46 cfs 4,701 cf
Outflow=0.46 cfs 4,701 cf

Pond 5P: Swale1 Peak Elev=1,665.32' Storage=9,978 cf Inflow=3.20 cfs 9,985 cf
Outflow=0.00 cfs 0 cf

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,684.51' Storage=0.149 af Inflow=3.91 cfs 11,153 cf
Outflow=0.46 cfs 4,701 cf

Total Runoff Area = 170,015 sf Runoff Volume = 21,138 cf Average Runoff Depth = 1.49"
100.00% Pervious = 170,015 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

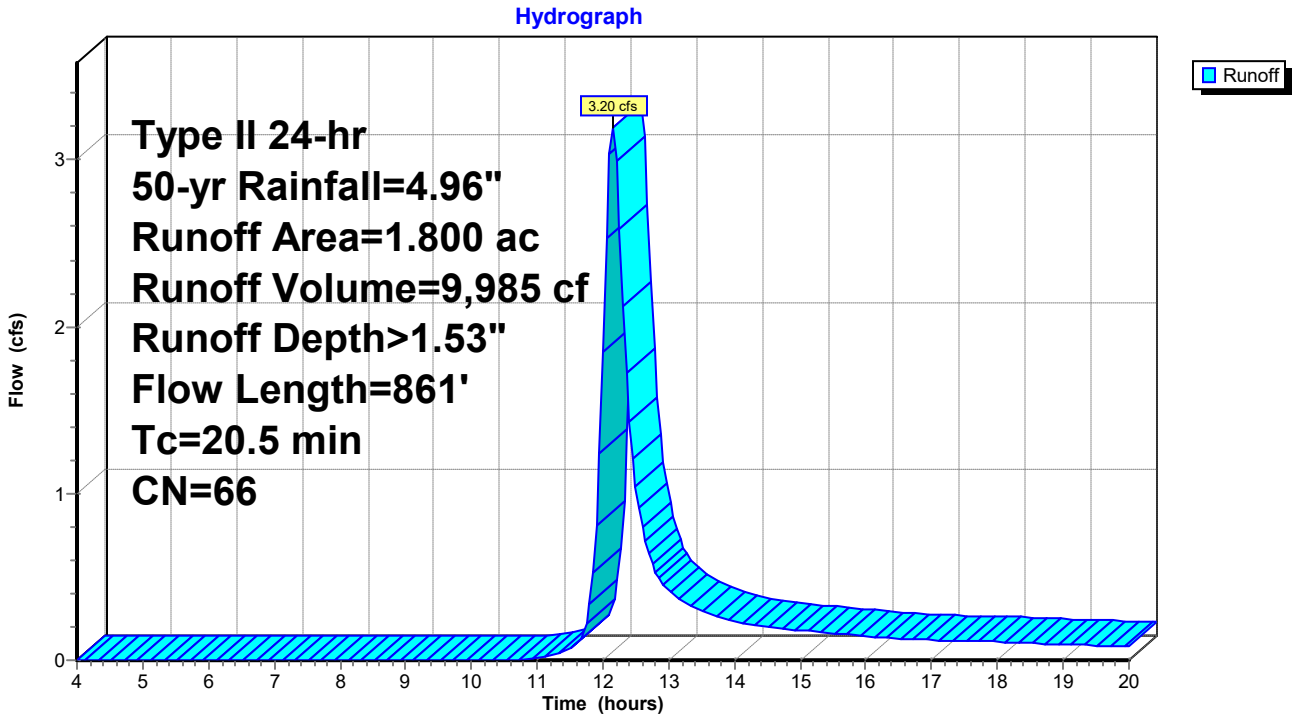
Runoff = 3.20 cfs @ 12.15 hrs, Volume= 9,985 cf, Depth> 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.24	0.00	0.00
4.25	0.26	0.00	0.00
4.50	0.27	0.00	0.00
4.75	0.29	0.00	0.00
5.00	0.31	0.00	0.00
5.25	0.33	0.00	0.00
5.50	0.35	0.00	0.00
5.75	0.37	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.42	0.00	0.00
6.50	0.44	0.00	0.00
6.75	0.47	0.00	0.00
7.00	0.49	0.00	0.00
7.25	0.52	0.00	0.00
7.50	0.54	0.00	0.00
7.75	0.57	0.00	0.00
8.00	0.60	0.00	0.00
8.25	0.62	0.00	0.00
8.50	0.66	0.00	0.00
8.75	0.69	0.00	0.00
9.00	0.73	0.00	0.00
9.25	0.77	0.00	0.00
9.50	0.81	0.00	0.00
9.75	0.85	0.00	0.00
10.00	0.90	0.00	0.00
10.25	0.95	0.00	0.00
10.50	1.01	0.00	0.00
10.75	1.08	0.00	0.00
11.00	1.17	0.00	0.01
11.25	1.27	0.01	0.03
11.50	1.40	0.03	0.07
11.75	1.92	0.13	0.22
12.00	3.29	0.69	**1.85**
12.25	3.50	0.80	**2.59**
12.50	3.65	0.88	1.04
12.75	3.75	0.94	0.58
13.00	3.83	0.99	0.41
13.25	3.90	1.03	0.34
13.50	3.96	1.06	0.30
13.75	4.02	1.10	0.26
14.00	4.07	1.13	0.23
14.25	4.11	1.15	0.21
14.50	4.15	1.18	0.20
14.75	4.20	1.20	0.19
15.00	4.23	1.23	0.18
15.25	4.27	1.25	0.17
15.50	4.30	1.27	0.16
15.75	4.34	1.29	0.15
16.00	4.36	1.31	0.14
16.25	4.39	1.33	0.13
16.50	4.42	1.35	0.13
16.75	4.45	1.36	0.13
17.00	4.47	1.38	0.12
17.25	4.50	1.39	0.12
17.50	4.52	1.41	0.12
17.75	4.55	1.43	0.11
18.00	4.57	1.44	0.11
18.25	4.59	1.45	0.11
18.50	4.61	1.47	0.10
18.75	4.63	1.48	0.10
19.00	4.65	1.49	0.10
19.25	4.67	1.51	0.09
19.50	4.69	1.52	0.09
19.75	4.71	1.53	0.09
20.00	**4.72**	**1.54**	0.08

Summary for Subcatchment 7S: DA-2

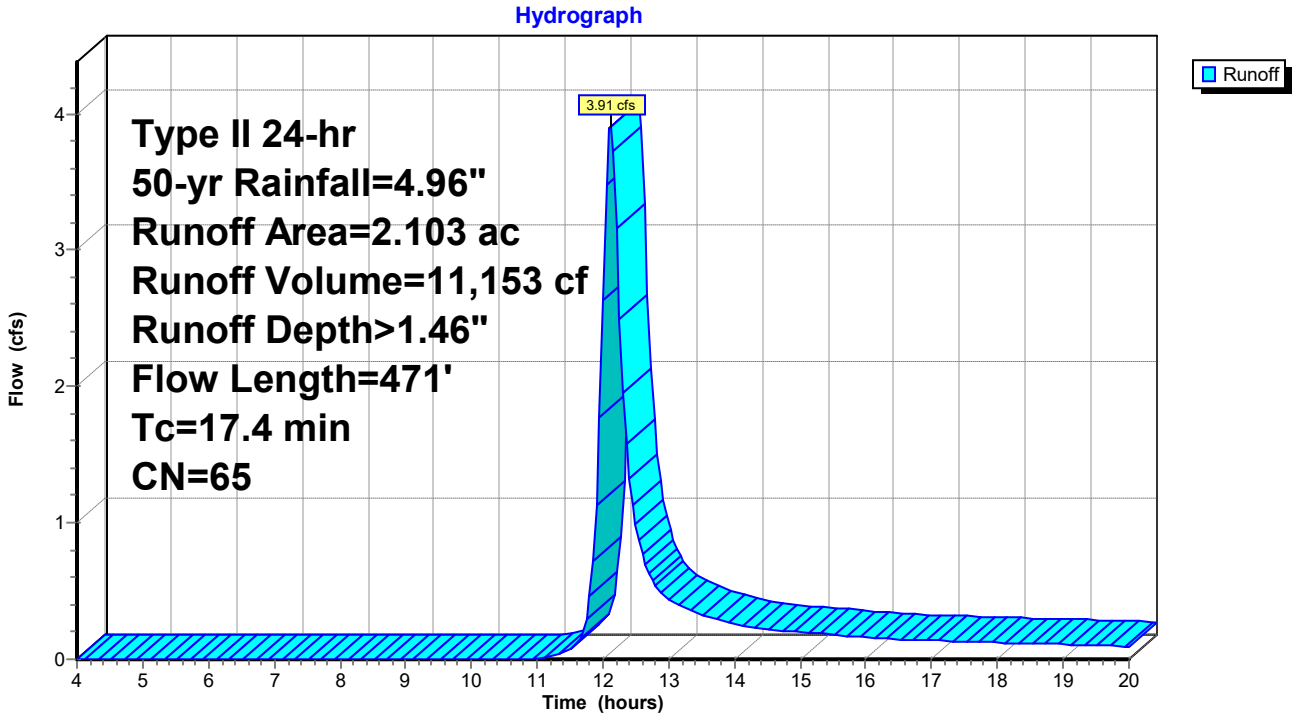
Runoff = 3.91 cfs @ 12.11 hrs, Volume= 11,153 cf, Depth> 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

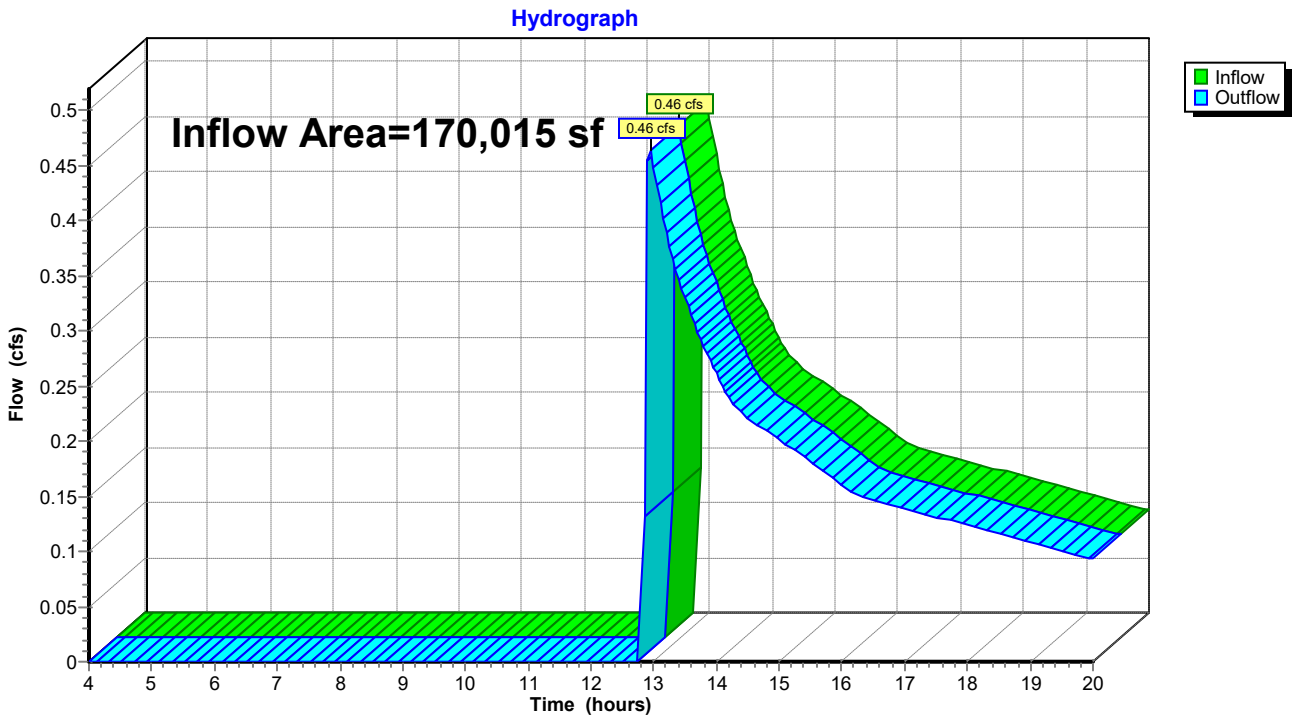
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.24	0.00	0.00
4.25	0.26	0.00	0.00
4.50	0.27	0.00	0.00
4.75	0.29	0.00	0.00
5.00	0.31	0.00	0.00
5.25	0.33	0.00	0.00
5.50	0.35	0.00	0.00
5.75	0.37	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.42	0.00	0.00
6.50	0.44	0.00	0.00
6.75	0.47	0.00	0.00
7.00	0.49	0.00	0.00
7.25	0.52	0.00	0.00
7.50	0.54	0.00	0.00
7.75	0.57	0.00	0.00
8.00	0.60	0.00	0.00
8.25	0.62	0.00	0.00
8.50	0.66	0.00	0.00
8.75	0.69	0.00	0.00
9.00	0.73	0.00	0.00
9.25	0.77	0.00	0.00
9.50	0.81	0.00	0.00
9.75	0.85	0.00	0.00
10.00	0.90	0.00	0.00
10.25	0.95	0.00	0.00
10.50	1.01	0.00	0.00
10.75	1.08	0.00	0.00
11.00	1.17	0.00	0.00
11.25	1.27	0.01	0.03
11.50	1.40	0.02	0.07
11.75	1.92	0.11	0.29
12.00	3.29	0.64	**2.64**
12.25	3.50	0.75	**2.49**
12.50	3.65	0.83	0.98
12.75	3.75	0.88	0.58
13.00	3.83	0.93	0.44
13.25	3.90	0.97	0.37
13.50	3.96	1.01	0.33
13.75	4.02	1.04	0.29
14.00	4.07	1.07	0.26
14.25	4.11	1.09	0.23
14.50	4.15	1.12	0.22
14.75	4.20	1.14	0.21
15.00	4.23	1.17	0.20
15.25	4.27	1.19	0.19
15.50	4.30	1.21	0.18
15.75	4.34	1.23	0.17
16.00	4.36	1.25	0.16
16.25	4.39	1.26	0.15
16.50	4.42	1.28	0.15
16.75	4.45	1.30	0.14
17.00	4.47	1.31	0.14
17.25	4.50	1.33	0.13
17.50	4.52	1.34	0.13
17.75	4.55	1.36	0.13
18.00	4.57	1.37	0.12
18.25	4.59	1.39	0.12
18.50	4.61	1.40	0.12
18.75	4.63	1.41	0.11
19.00	4.65	1.43	0.11
19.25	4.67	1.44	0.10
19.50	4.69	1.45	0.10
19.75	4.71	1.46	0.10
20.00	**4.72**	**1.47**	0.09

Summary for Reach 14R: Post w/ BMP

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 0.33" for 50-yr event
Inflow = 0.46 cfs @ 12.94 hrs, Volume= 4,701 cf
Outflow = 0.46 cfs @ 12.94 hrs, Volume= 4,701 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post w/ BMP



Hydrograph for Reach 14R: Post w/ BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00
4.25	0.00		0.00
4.50	0.00		0.00
4.75	0.00		0.00
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.00		0.00
8.50	0.00		0.00
8.75	0.00		0.00
9.00	0.00		0.00
9.25	0.00		0.00
9.50	0.00		0.00
9.75	0.00		0.00
10.00	0.00		0.00
10.25	0.00		0.00
10.50	0.00		0.00
10.75	0.00		0.00
11.00	0.00		0.00
11.25	0.00		0.00
11.50	0.00		0.00
11.75	0.00		0.00
12.00	0.00		0.00
12.25	0.00		0.00
12.50	0.00		0.00
12.75	**0.00**		**0.00**
13.00	**0.45**		**0.45**
13.25	0.38		0.38
13.50	0.33		0.33
13.75	0.29		0.29
14.00	0.26		0.26
14.25	0.24		0.24
14.50	0.22		0.22
14.75	0.21		0.21
15.00	0.20		0.20
15.25	0.19		0.19
15.50	0.18		0.18
15.75	0.17		0.17
16.00	0.16		0.16
16.25	0.15		0.15
16.50	0.15		0.15
16.75	0.14		0.14
17.00	0.14		0.14
17.25	0.14		0.14
17.50	0.13		0.13
17.75	0.13		0.13
18.00	0.12		0.12
18.25	0.12		0.12
18.50	0.12		0.12
18.75	0.11		0.11
19.00	0.11		0.11
19.25	0.10		0.10
19.50	0.10		0.10
19.75	0.10		0.10
20.00	0.09		0.09

Summary for Pond 5P: Swale1

Inflow Area = 78,408 sf, 0.00% Impervious, Inflow Depth > 1.53" for 50-yr event
Inflow = 3.20 cfs @ 12.15 hrs, Volume= 9,985 cf
Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,665.32' @ 20.00 hrs Surf.Area= 5,242 sf Storage= 9,978 cf

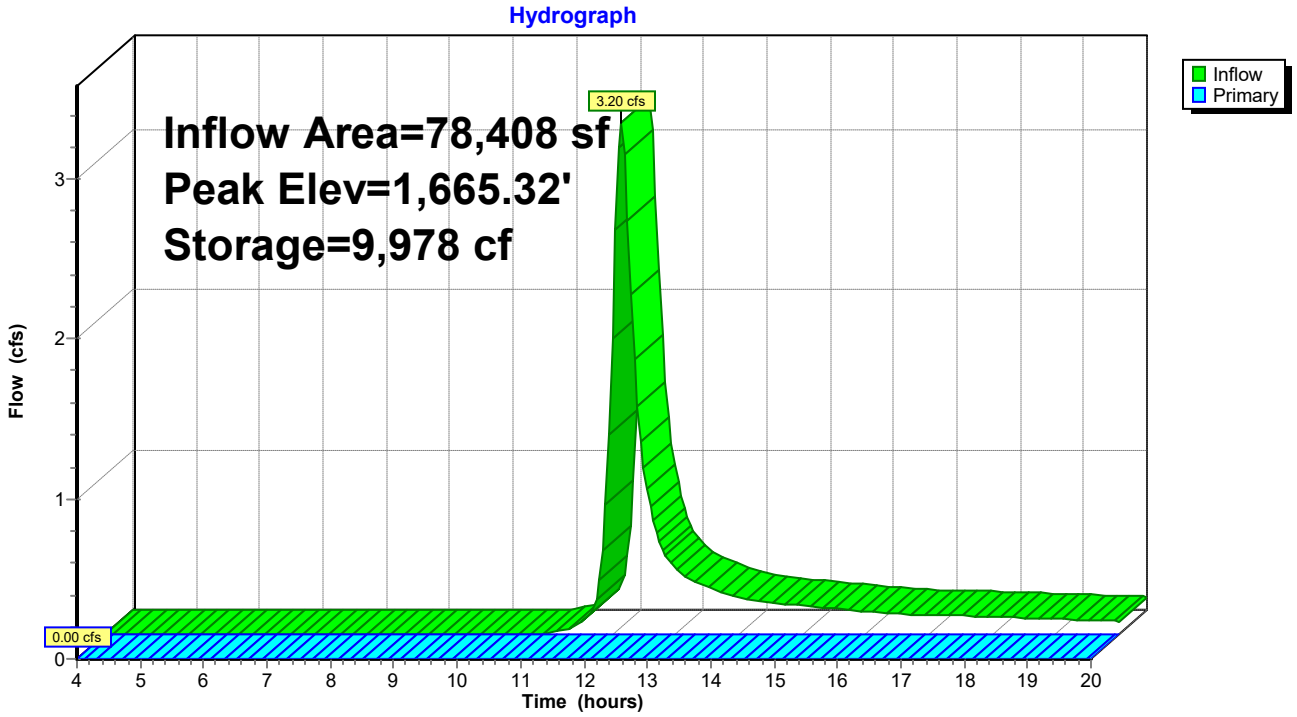
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,662.00'	13,877 cf	**8.00'W x 125.00'L x 4.00'H Prismatoid Z=4.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,665.50'	**180.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 4.00 hrs HW=1,662.00' (Free Discharge)
└**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Swale1



Hydrograph for Pond 5P: Swale1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0	1,662.00	**0.00**
4.50	0.00	0	1,662.00	0.00
5.00	0.00	0	1,662.00	0.00
5.50	0.00	0	1,662.00	0.00
6.00	0.00	0	1,662.00	0.00
6.50	0.00	0	1,662.00	0.00
7.00	0.00	0	1,662.00	0.00
7.50	0.00	0	1,662.00	0.00
8.00	0.00	0	1,662.00	0.00
8.50	0.00	0	1,662.00	0.00
9.00	0.00	0	1,662.00	0.00
9.50	0.00	0	1,662.00	0.00
10.00	0.00	0	1,662.00	0.00
10.50	0.00	0	1,662.00	0.00
11.00	0.01	3	1,662.00	0.00
11.50	0.07	60	1,662.06	0.00
12.00	**1.85**	872	1,662.65	0.00
12.50	**1.04**	4,881	1,664.17	0.00
13.00	0.41	6,013	1,664.46	0.00
13.50	0.30	6,634	1,664.61	0.00
14.00	0.23	7,107	1,664.72	0.00
14.50	0.20	7,488	1,664.81	0.00
15.00	0.18	7,825	1,664.88	0.00
15.50	0.16	8,131	1,664.95	0.00
16.00	0.14	8,404	1,665.01	0.00
16.50	0.13	8,646	1,665.06	0.00
17.00	0.12	8,872	1,665.10	0.00
17.50	0.12	9,086	1,665.15	0.00
18.00	0.11	9,289	1,665.19	0.00
18.50	0.10	9,480	1,665.23	0.00
19.00	0.10	9,658	1,665.26	0.00
19.50	0.09	9,824	1,665.29	0.00
20.00	0.08	**9,978**	**1,665.32**	0.00

Stage-Discharge for Pond 5P: Swale1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,662.00	0.00	1,663.02	0.00	1,664.04	0.00	1,665.06	0.00
1,662.02	0.00	1,663.04	0.00	1,664.06	0.00	1,665.08	0.00
1,662.04	0.00	1,663.06	0.00	1,664.08	0.00	1,665.10	0.00
1,662.06	0.00	1,663.08	0.00	1,664.10	0.00	1,665.12	0.00
1,662.08	0.00	1,663.10	0.00	1,664.12	0.00	1,665.14	0.00
1,662.10	0.00	1,663.12	0.00	1,664.14	0.00	1,665.16	0.00
1,662.12	0.00	1,663.14	0.00	1,664.16	0.00	1,665.18	0.00
1,662.14	0.00	1,663.16	0.00	1,664.18	0.00	1,665.20	0.00
1,662.16	0.00	1,663.18	0.00	1,664.20	0.00	1,665.22	0.00
1,662.18	0.00	1,663.20	0.00	1,664.22	0.00	1,665.24	0.00
1,662.20	0.00	1,663.22	0.00	1,664.24	0.00	1,665.26	0.00
1,662.22	0.00	1,663.24	0.00	1,664.26	0.00	1,665.28	0.00
1,662.24	0.00	1,663.26	0.00	1,664.28	0.00	1,665.30	0.00
1,662.26	0.00	1,663.28	0.00	1,664.30	0.00	1,665.32	0.00
1,662.28	0.00	1,663.30	0.00	1,664.32	0.00	1,665.34	0.00
1,662.30	0.00	1,663.32	0.00	1,664.34	0.00	1,665.36	0.00
1,662.32	0.00	1,663.34	0.00	1,664.36	0.00	1,665.38	0.00
1,662.34	0.00	1,663.36	0.00	1,664.38	0.00	1,665.40	0.00
1,662.36	0.00	1,663.38	0.00	1,664.40	0.00	1,665.42	0.00
1,662.38	0.00	1,663.40	0.00	1,664.42	0.00	1,665.44	0.00
1,662.40	0.00	1,663.42	0.00	1,664.44	0.00	1,665.46	0.00
1,662.42	0.00	1,663.44	0.00	1,664.46	0.00	1,665.48	0.00
1,662.44	0.00	1,663.46	0.00	1,664.48	0.00	1,665.50	0.00
1,662.46	0.00	1,663.48	0.00	1,664.50	0.00	1,665.52	1.66
1,662.48	0.00	1,663.50	0.00	1,664.52	0.00	1,665.54	4.71
1,662.50	0.00	1,663.52	0.00	1,664.54	0.00	1,665.56	8.65
1,662.52	0.00	1,663.54	0.00	1,664.56	0.00	1,665.58	13.32
1,662.54	0.00	1,663.56	0.00	1,664.58	0.00	1,665.60	18.61
1,662.56	0.00	1,663.58	0.00	1,664.60	0.00	1,665.62	24.46
1,662.58	0.00	1,663.60	0.00	1,664.62	0.00	1,665.64	30.83
1,662.60	0.00	1,663.62	0.00	1,664.64	0.00	1,665.66	37.66
1,662.62	0.00	1,663.64	0.00	1,664.66	0.00	1,665.68	44.94
1,662.64	0.00	1,663.66	0.00	1,664.68	0.00	1,665.70	52.63
1,662.66	0.00	1,663.68	0.00	1,664.70	0.00	1,665.72	60.72
1,662.68	0.00	1,663.70	0.00	1,664.72	0.00	1,665.74	69.19
1,662.70	0.00	1,663.72	0.00	1,664.74	0.00	1,665.76	78.01
1,662.72	0.00	1,663.74	0.00	1,664.76	0.00	1,665.78	87.18
1,662.74	0.00	1,663.76	0.00	1,664.78	0.00	1,665.80	96.68
1,662.76	0.00	1,663.78	0.00	1,664.80	0.00	1,665.82	106.51
1,662.78	0.00	1,663.80	0.00	1,664.82	0.00	1,665.84	116.65
1,662.80	0.00	1,663.82	0.00	1,664.84	0.00	1,665.86	127.09
1,662.82	0.00	1,663.84	0.00	1,664.86	0.00	1,665.88	137.82
1,662.84	0.00	1,663.86	0.00	1,664.88	0.00	1,665.90	148.84
1,662.86	0.00	1,663.88	0.00	1,664.90	0.00	1,665.92	160.14
1,662.88	0.00	1,663.90	0.00	1,664.92	0.00	1,665.94	171.71
1,662.90	0.00	1,663.92	0.00	1,664.94	0.00	1,665.96	183.54
1,662.92	0.00	1,663.94	0.00	1,664.96	0.00	1,665.98	195.64
1,662.94	0.00	1,663.96	0.00	1,664.98	0.00	1,666.00	**207.99**
1,662.96	0.00	1,663.98	0.00	1,665.00	0.00		
1,662.98	0.00	1,664.00	0.00	1,665.02	0.00		
1,663.00	0.00	1,664.02	0.00	1,665.04	0.00		

Stage-Area-Storage for Pond 5P: Swale1

Elevation (feet)	Storage (cubic-feet)
1,662.00	0
1,662.05	51
1,662.10	105
1,662.15	162
1,662.20	221
1,662.25	284
1,662.30	348
1,662.35	416
1,662.40	486
1,662.45	560
1,662.50	636
1,662.55	714
1,662.60	796
1,662.65	881
1,662.70	968
1,662.75	1,058
1,662.80	1,151
1,662.85	1,247
1,662.90	1,346
1,662.95	1,448
1,663.00	1,553
1,663.05	1,661
1,663.10	1,772
1,663.15	1,886
1,663.20	2,003
1,663.25	2,123
1,663.30	2,246
1,663.35	2,372
1,663.40	2,501
1,663.45	2,634
1,663.50	2,769
1,663.55	2,908
1,663.60	3,049
1,663.65	3,194
1,663.70	3,342
1,663.75	3,494
1,663.80	3,648
1,663.85	3,806
1,663.90	3,967
1,663.95	4,131
1,664.00	4,299
1,664.05	4,470
1,664.10	4,644
1,664.15	4,821
1,664.20	5,002
1,664.25	5,186
1,664.30	5,374
1,664.35	5,565
1,664.40	5,759
1,664.45	5,957
1,664.50	6,158
1,664.55	6,363
1,664.60	6,571
1,664.65	6,783
1,664.70	6,998
1,664.75	7,217
1,664.80	7,439
1,664.85	7,665
1,664.90	7,894
1,664.95	8,127
1,665.00	8,364
1,665.05	8,604
1,665.10	8,848
1,665.15	9,096
1,665.20	9,347
1,665.25	9,602
1,665.30	9,860
1,665.35	10,122
1,665.40	10,388
1,665.45	10,658
1,665.50	10,932
1,665.55	11,209
1,665.60	11,490
1,665.65	11,775
1,665.70	12,064
1,665.75	12,356
1,665.80	12,653
1,665.85	12,953
1,665.90	13,257
1,665.95	13,565
1,666.00	**13,877**

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area = 91,607 sf, 0.00% Impervious, Inflow Depth > 1.46" for 50-yr event
Inflow = 3.91 cfs @ 12.11 hrs, Volume= 11,153 cf
Outflow = 0.46 cfs @ 12.94 hrs, Volume= 4,701 cf, Atten= 88%, Lag= 50.0 min
Primary = 0.46 cfs @ 12.94 hrs, Volume= 4,701 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,684.51' @ 12.94 hrs Surf.Area= 0.111 ac Storage= 0.149 af

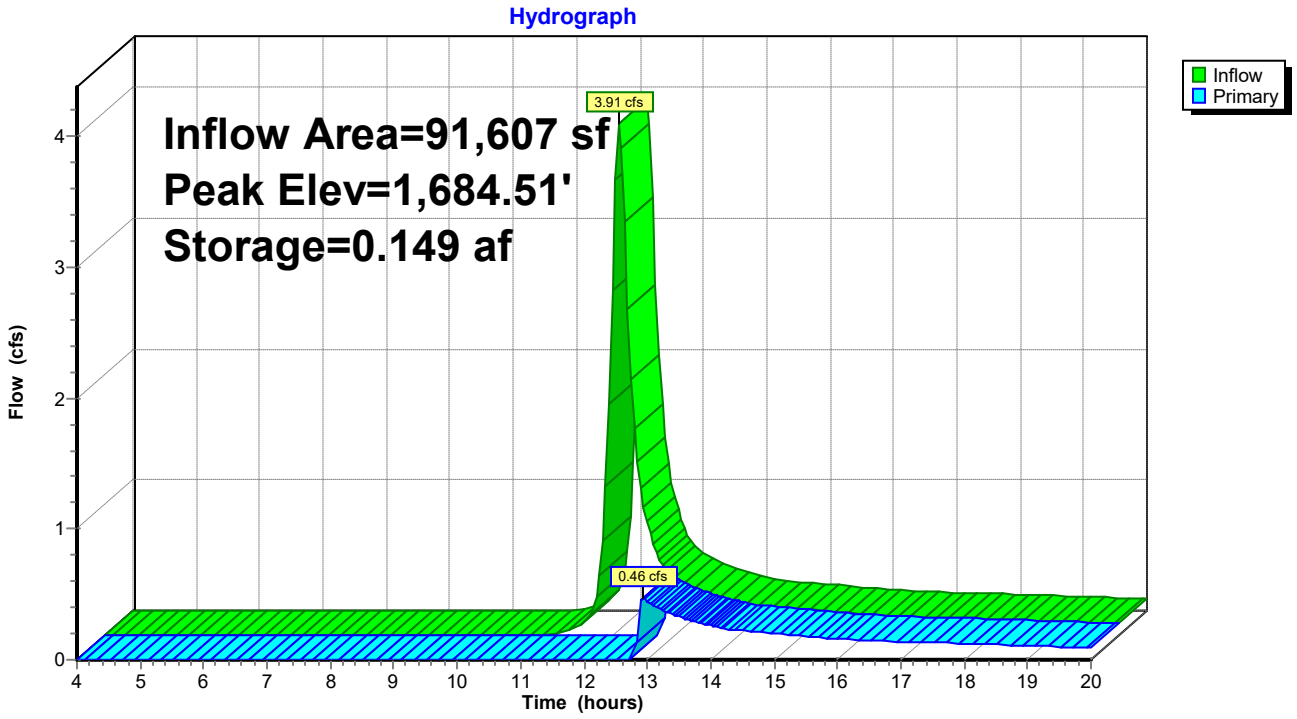
Plug-Flow detention time= 208.3 min calculated for 4,686 cf (42% of inflow)
Center-of-Mass det. time= 117.1 min (933.7 - 816.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,683.00'	0.159 af	**25.00'W x 150.00'L x 1.60'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,684.50'	**150.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.38 cfs @ 12.94 hrs HW=1,684.51' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 0.38 cfs @ 0.25 fps)

Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0.000	1,683.00	0.00
4.50	0.00	0.000	1,683.00	0.00
5.00	0.00	0.000	1,683.00	0.00
5.50	0.00	0.000	1,683.00	0.00
6.00	0.00	0.000	1,683.00	0.00
6.50	0.00	0.000	1,683.00	0.00
7.00	0.00	0.000	1,683.00	0.00
7.50	0.00	0.000	1,683.00	0.00
8.00	0.00	0.000	1,683.00	0.00
8.50	0.00	0.000	1,683.00	0.00
9.00	0.00	0.000	1,683.00	0.00
9.50	0.00	0.000	1,683.00	0.00
10.00	0.00	0.000	1,683.00	0.00
10.50	0.00	0.000	1,683.00	0.00
11.00	0.00	0.000	1,683.00	0.00
11.50	0.07	0.001	1,683.01	0.00
12.00	**2.64**	0.027	1,683.30	0.00
12.50	**0.98**	**0.128**	**1,684.32**	**0.00**
13.00	0.44	**0.149**	**1,684.51**	**0.45**
13.50	0.33	0.148	1,684.51	0.33
14.00	0.26	0.148	1,684.51	0.26
14.50	0.22	0.148	1,684.51	0.22
15.00	0.20	0.148	1,684.51	0.20
15.50	0.18	0.148	1,684.51	0.18
16.00	0.16	0.148	1,684.51	0.16
16.50	0.15	0.148	1,684.50	0.15
17.00	0.14	0.148	1,684.50	0.14
17.50	0.13	0.148	1,684.50	0.13
18.00	0.12	0.148	1,684.50	0.12
18.50	0.12	0.148	1,684.50	0.12
19.00	0.11	0.148	1,684.50	0.11
19.50	0.10	0.148	1,684.50	0.10
20.00	0.09	0.148	1,684.50	0.09

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,683.00	0.00	1,683.51	0.00	1,684.02	0.00	1,684.53	1.98
1,683.01	0.00	1,683.52	0.00	1,684.03	0.00	1,684.54	3.05
1,683.02	0.00	1,683.53	0.00	1,684.04	0.00	1,684.55	4.26
1,683.03	0.00	1,683.54	0.00	1,684.05	0.00	1,684.56	5.60
1,683.04	0.00	1,683.55	0.00	1,684.06	0.00	1,684.57	7.06
1,683.05	0.00	1,683.56	0.00	1,684.07	0.00	1,684.58	8.62
1,683.06	0.00	1,683.57	0.00	1,684.08	0.00	1,684.59	10.29
1,683.07	0.00	1,683.58	0.00	1,684.09	0.00	1,684.60	**12.05**
1,683.08	0.00	1,683.59	0.00	1,684.10	0.00		
1,683.09	0.00	1,683.60	0.00	1,684.11	0.00		
1,683.10	0.00	1,683.61	0.00	1,684.12	0.00		
1,683.11	0.00	1,683.62	0.00	1,684.13	0.00		
1,683.12	0.00	1,683.63	0.00	1,684.14	0.00		
1,683.13	0.00	1,683.64	0.00	1,684.15	0.00		
1,683.14	0.00	1,683.65	0.00	1,684.16	0.00		
1,683.15	0.00	1,683.66	0.00	1,684.17	0.00		
1,683.16	0.00	1,683.67	0.00	1,684.18	0.00		
1,683.17	0.00	1,683.68	0.00	1,684.19	0.00		
1,683.18	0.00	1,683.69	0.00	1,684.20	0.00		
1,683.19	0.00	1,683.70	0.00	1,684.21	0.00		
1,683.20	0.00	1,683.71	0.00	1,684.22	0.00		
1,683.21	0.00	1,683.72	0.00	1,684.23	0.00		
1,683.22	0.00	1,683.73	0.00	1,684.24	0.00		
1,683.23	0.00	1,683.74	0.00	1,684.25	0.00		
1,683.24	0.00	1,683.75	0.00	1,684.26	0.00		
1,683.25	0.00	1,683.76	0.00	1,684.27	0.00		
1,683.26	0.00	1,683.77	0.00	1,684.28	0.00		
1,683.27	0.00	1,683.78	0.00	1,684.29	0.00		
1,683.28	0.00	1,683.79	0.00	1,684.30	0.00		
1,683.29	0.00	1,683.80	0.00	1,684.31	0.00		
1,683.30	0.00	1,683.81	0.00	1,684.32	0.00		
1,683.31	0.00	1,683.82	0.00	1,684.33	0.00		
1,683.32	0.00	1,683.83	0.00	1,684.34	0.00		
1,683.33	0.00	1,683.84	0.00	1,684.35	0.00		
1,683.34	0.00	1,683.85	0.00	1,684.36	0.00		
1,683.35	0.00	1,683.86	0.00	1,684.37	0.00		
1,683.36	0.00	1,683.87	0.00	1,684.38	0.00		
1,683.37	0.00	1,683.88	0.00	1,684.39	0.00		
1,683.38	0.00	1,683.89	0.00	1,684.40	0.00		
1,683.39	0.00	1,683.90	0.00	1,684.41	0.00		
1,683.40	0.00	1,683.91	0.00	1,684.42	0.00		
1,683.41	0.00	1,683.92	0.00	1,684.43	0.00		
1,683.42	0.00	1,683.93	0.00	1,684.44	0.00		
1,683.43	0.00	1,683.94	0.00	1,684.45	0.00		
1,683.44	0.00	1,683.95	0.00	1,684.46	0.00		
1,683.45	0.00	1,683.96	0.00	1,684.47	0.00		
1,683.46	0.00	1,683.97	0.00	1,684.48	0.00		
1,683.47	0.00	1,683.98	0.00	1,684.49	0.00		
1,683.48	0.00	1,683.99	0.00	1,684.50	0.00		
1,683.49	0.00	1,684.00	0.00	1,684.51	0.38		
1,683.50	0.00	1,684.01	0.00	1,684.52	1.08		

Stage-Area-Storage for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Storage (acre-feet)
1,683.00	0.000
1,683.02	0.002
1,683.04	0.003
1,683.06	0.005
1,683.08	0.007
1,683.10	0.009
1,683.12	0.010
1,683.14	0.012
1,683.16	0.014
1,683.18	0.016
1,683.20	0.018
1,683.22	0.019
1,683.24	0.021
1,683.26	0.023
1,683.28	0.025
1,683.30	0.027
1,683.32	0.028
1,683.34	0.030
1,683.36	0.032
1,683.38	0.034
1,683.40	0.036
1,683.42	0.038
1,683.44	0.039
1,683.46	0.041
1,683.48	0.043
1,683.50	0.045
1,683.52	0.047
1,683.54	0.049
1,683.56	0.051
1,683.58	0.053
1,683.60	0.055
1,683.62	0.056
1,683.64	0.058
1,683.66	0.060
1,683.68	0.062
1,683.70	0.064
1,683.72	0.066
1,683.74	0.068
1,683.76	0.070
1,683.78	0.072
1,683.80	0.074
1,683.82	0.076
1,683.84	0.078
1,683.86	0.080
1,683.88	0.082
1,683.90	0.084
1,683.92	0.086
1,683.94	0.088
1,683.96	0.090
1,683.98	0.092
1,684.00	0.094
1,684.02	0.096
1,684.04	0.098
1,684.06	0.100
1,684.08	0.103
1,684.10	0.105
1,684.12	0.107
1,684.14	0.109
1,684.16	0.111
1,684.18	0.113
1,684.20	0.115
1,684.22	0.117
1,684.24	0.119
1,684.26	0.121
1,684.28	0.124
1,684.30	0.126
1,684.32	0.128
1,684.34	0.130
1,684.36	0.132
1,684.38	0.134
1,684.40	0.137
1,684.42	0.139
1,684.44	0.141
1,684.46	0.143
1,684.48	0.145
1,684.50	0.148
1,684.52	0.150
1,684.54	0.152
1,684.56	0.154
1,684.58	0.157
1,684.60	**0.159**

Time span=4.00-20.00 hrs, dt=0.05 hrs, 321 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.800 ac 0.00% Impervious Runoff Depth>1.95"
Flow Length=861' Tc=20.5 min CN=66 Runoff=4.12 cfs 12,729 cf

Subcatchment 7S: DA-2 Runoff Area=2.103 ac 0.00% Impervious Runoff Depth>1.87"
Flow Length=471' Tc=17.4 min CN=65 Runoff=5.07 cfs 14,288 cf

Reach 14R: Post w/ BMP Inflow=1.75 cfs 9,664 cf
Outflow=1.75 cfs 9,664 cf

Pond 5P: Swale1 Peak Elev=1,665.50' Storage=10,944 cf Inflow=4.12 cfs 12,729 cf
Outflow=0.19 cfs 1,791 cf

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,684.53' Storage=0.151 af Inflow=5.07 cfs 14,288 cf
Outflow=1.75 cfs 7,873 cf

Total Runoff Area = 170,015 sf Runoff Volume = 27,017 cf Average Runoff Depth = 1.91"
100.00% Pervious = 170,015 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

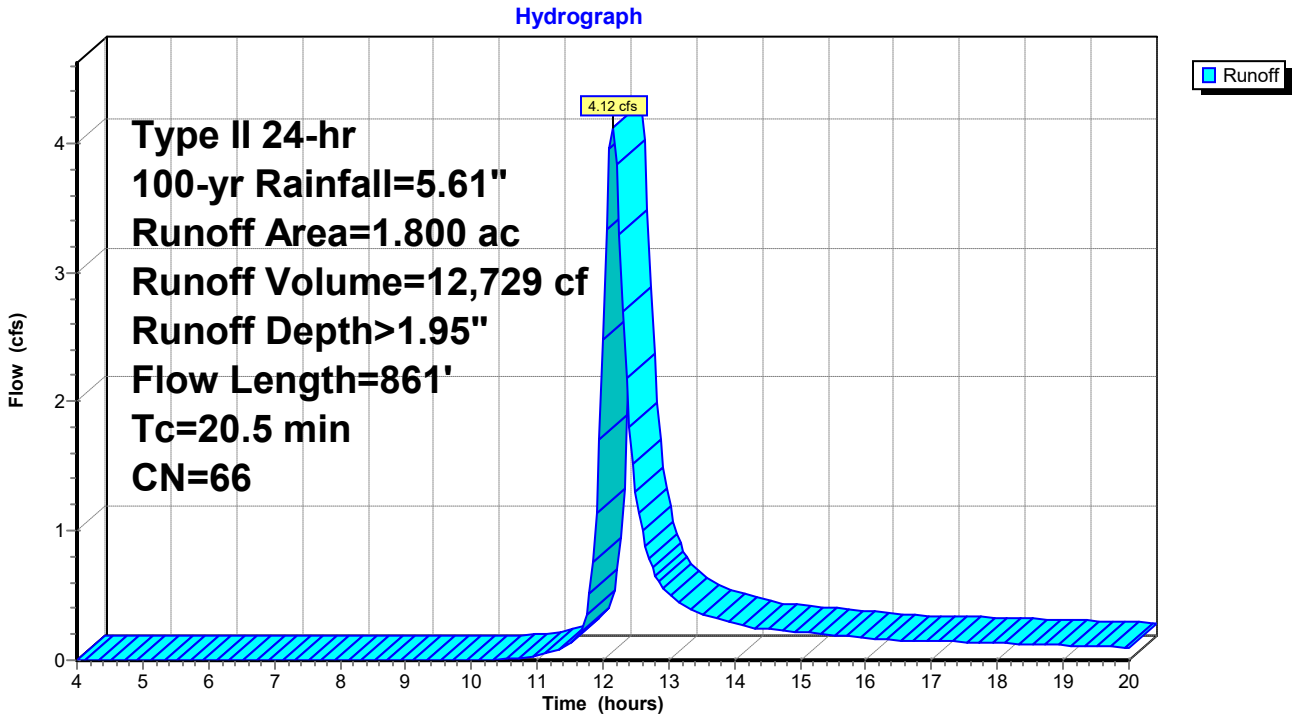
Runoff = 4.12 cfs @ 12.14 hrs, Volume= 12,729 cf, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (ac)	CN	Description
0.379	89	Gravel roads, HSG C
0.168	58	Meadow, non-grazed, HSG B
1.253	60	Woods, Fair, HSG B
1.800	66	Weighted Average
1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	100	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
3.8	392	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	369	0.0540	4.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.5	861	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.27	0.00	0.00
4.25	0.29	0.00	0.00
4.50	0.31	0.00	0.00
4.75	0.33	0.00	0.00
5.00	0.35	0.00	0.00
5.25	0.38	0.00	0.00
5.50	0.40	0.00	0.00
5.75	0.42	0.00	0.00
6.00	0.45	0.00	0.00
6.25	0.47	0.00	0.00
6.50	0.50	0.00	0.00
6.75	0.53	0.00	0.00
7.00	0.56	0.00	0.00
7.25	0.58	0.00	0.00
7.50	0.61	0.00	0.00
7.75	0.64	0.00	0.00
8.00	0.67	0.00	0.00
8.25	0.71	0.00	0.00
8.50	0.74	0.00	0.00
8.75	0.78	0.00	0.00
9.00	0.82	0.00	0.00
9.25	0.87	0.00	0.00
9.50	0.91	0.00	0.00
9.75	0.96	0.00	0.00
10.00	1.02	0.00	0.00
10.25	1.08	0.00	0.00
10.50	1.14	0.00	0.01
10.75	1.22	0.01	0.02
11.00	1.32	0.02	0.04
11.25	1.44	0.03	0.07
11.50	1.59	0.05	0.12
11.75	2.17	0.21	0.35
12.00	3.72	0.92	**2.48**
12.25	3.96	1.06	**3.30**
12.50	4.12	1.16	1.31
12.75	4.24	1.23	0.72
13.00	4.33	1.29	0.51
13.25	4.41	1.34	0.42
13.50	4.48	1.39	0.36
13.75	4.54	1.43	0.32
14.00	4.60	1.46	0.29
14.25	4.65	1.49	0.26
14.50	4.70	1.53	0.24
14.75	4.74	1.56	0.23
15.00	4.79	1.58	0.22
15.25	4.83	1.61	0.21
15.50	4.87	1.64	0.20
15.75	4.90	1.66	0.18
16.00	4.94	1.68	0.17
16.25	4.97	1.71	0.16
16.50	5.00	1.73	0.16
16.75	5.03	1.75	0.15
17.00	5.06	1.77	0.15
17.25	5.09	1.79	0.14
17.50	5.11	1.81	0.14
17.75	5.14	1.82	0.14
18.00	5.17	1.84	0.13
18.25	5.19	1.86	0.13
18.50	5.22	1.88	0.12
18.75	5.24	1.89	0.12
19.00	5.26	1.91	0.12
19.25	5.28	1.92	0.11
19.50	5.30	1.94	0.11
19.75	5.32	1.95	0.10
20.00	**5.34**	**1.96**	0.10

Summary for Subcatchment 7S: DA-2

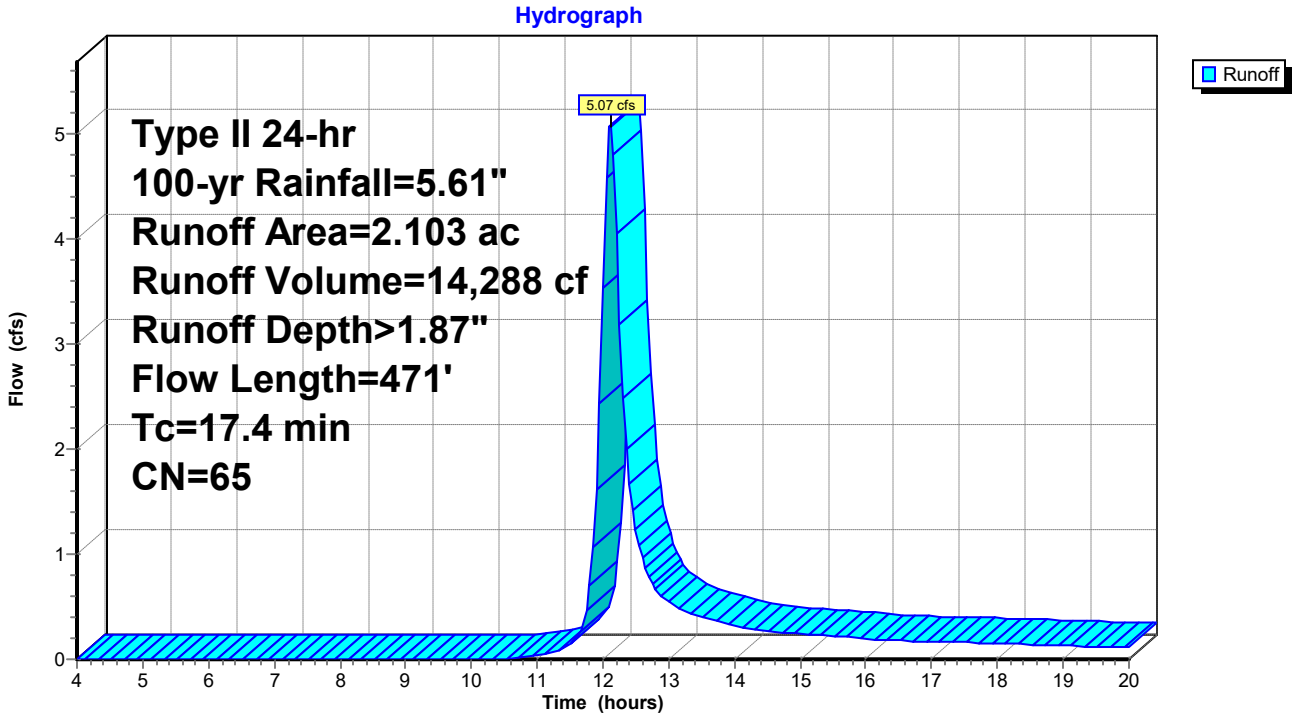
Runoff = 5.07 cfs @ 12.11 hrs, Volume= 14,288 cf, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (ac)	CN	Description
0.454	89	Gravel roads, HSG C
0.283	60	Woods, Fair, HSG B
1.366	58	Meadow, non-grazed, HSG B
2.103	65	Weighted Average
2.103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	52	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.58"
0.8	121	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	87	0.0570	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	211	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	471	Total			

Subcatchment 7S: DA-2



Hydrograph for Subcatchment 7S: DA-2

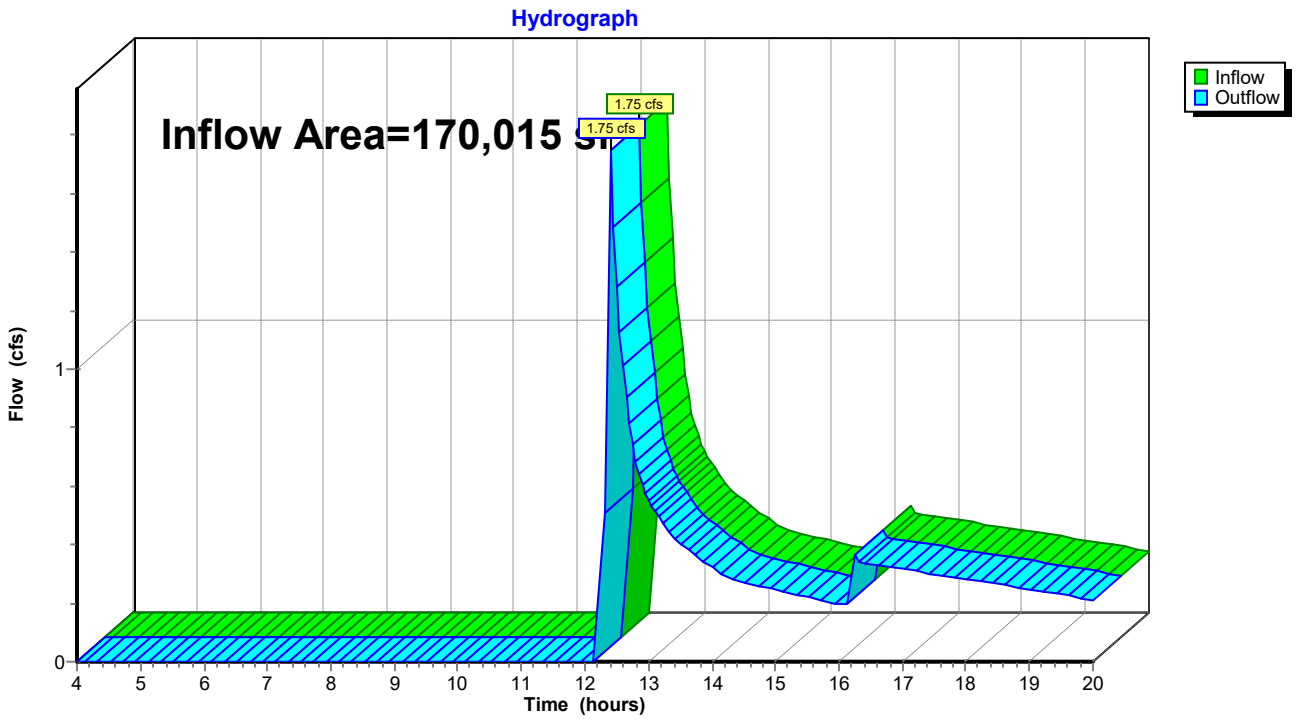
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
4.00	0.27	0.00	0.00
4.25	0.29	0.00	0.00
4.50	0.31	0.00	0.00
4.75	0.33	0.00	0.00
5.00	0.35	0.00	0.00
5.25	0.38	0.00	0.00
5.50	0.40	0.00	0.00
5.75	0.42	0.00	0.00
6.00	0.45	0.00	0.00
6.25	0.47	0.00	0.00
6.50	0.50	0.00	0.00
6.75	0.53	0.00	0.00
7.00	0.56	0.00	0.00
7.25	0.58	0.00	0.00
7.50	0.61	0.00	0.00
7.75	0.64	0.00	0.00
8.00	0.67	0.00	0.00
8.25	0.71	0.00	0.00
8.50	0.74	0.00	0.00
8.75	0.78	0.00	0.00
9.00	0.82	0.00	0.00
9.25	0.87	0.00	0.00
9.50	0.91	0.00	0.00
9.75	0.96	0.00	0.00
10.00	1.02	0.00	0.00
10.25	1.08	0.00	0.00
10.50	1.14	0.00	0.00
10.75	1.22	0.00	0.02
11.00	1.32	0.01	0.04
11.25	1.44	0.02	0.07
11.50	1.59	0.04	0.14
11.75	2.17	0.18	0.46
12.00	3.72	0.87	**3.53**
12.25	3.96	1.01	**3.18**
12.50	4.12	1.10	1.23
12.75	4.24	1.17	0.71
13.00	4.33	1.23	0.54
13.25	4.41	1.28	0.46
13.50	4.48	1.32	0.40
13.75	4.54	1.36	0.36
14.00	4.60	1.39	0.32
14.25	4.65	1.43	0.29
14.50	4.70	1.46	0.27
14.75	4.74	1.49	0.26
15.00	4.79	1.51	0.24
15.25	4.83	1.54	0.23
15.50	4.87	1.57	0.22
15.75	4.90	1.59	0.21
16.00	4.94	1.61	0.19
16.25	4.97	1.63	0.18
16.50	5.00	1.65	0.18
16.75	5.03	1.67	0.17
17.00	5.06	1.69	0.17
17.25	5.09	1.71	0.16
17.50	5.11	1.73	0.16
17.75	5.14	1.75	0.15
18.00	5.17	1.77	0.15
18.25	5.19	1.78	0.15
18.50	5.22	1.80	0.14
18.75	5.24	1.81	0.14
19.00	5.26	1.83	0.13
19.25	5.28	1.84	0.13
19.50	5.30	1.86	0.12
19.75	5.32	1.87	0.12
20.00	**5.34**	**1.88**	0.11

Summary for Reach 14R: Post w/ BMP

Inflow Area = 170,015 sf, 0.00% Impervious, Inflow Depth > 0.68" for 100-yr event
Inflow = 1.75 cfs @ 12.40 hrs, Volume= 9,664 cf
Outflow = 1.75 cfs @ 12.40 hrs, Volume= 9,664 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: Post w/ BMP



Hydrograph for Reach 14R: Post w/ BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
4.00	0.00		0.00
4.25	0.00		0.00
4.50	0.00		0.00
4.75	0.00		0.00
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.00		0.00
8.50	0.00		0.00
8.75	0.00		0.00
9.00	0.00		0.00
9.25	0.00		0.00
9.50	0.00		0.00
9.75	0.00		0.00
10.00	0.00		0.00
10.25	0.00		0.00
10.50	0.00		0.00
10.75	0.00		0.00
11.00	0.00		0.00
11.25	0.00		0.00
11.50	0.00		0.00
11.75	0.00		0.00
12.00	0.00		0.00
12.25	**0.00**		**0.00**
12.50	**1.29**		**1.29**
12.75	0.74		0.74
13.00	0.55		0.55
13.25	0.46		0.46
13.50	0.41		0.41
13.75	0.36		0.36
14.00	0.32		0.32
14.25	0.29		0.29
14.50	0.27		0.27
14.75	0.26		0.26
15.00	0.25		0.25
15.25	0.23		0.23
15.50	0.22		0.22
15.75	0.21		0.21
16.00	0.20		0.20
16.25	0.37		0.37
16.50	0.33		0.33
16.75	0.33		0.33
17.00	0.32		0.32
17.25	0.31		0.31
17.50	0.30		0.30
17.75	0.29		0.29
18.00	0.28		0.28
18.25	0.27		0.27
18.50	0.27		0.27
18.75	0.26		0.26
19.00	0.25		0.25
19.25	0.24		0.24
19.50	0.23		0.23
19.75	0.22		0.22
20.00	0.21		0.21

Summary for Pond 5P: Swale1

Inflow Area = 78,408 sf, 0.00% Impervious, Inflow Depth > 1.95" for 100-yr event
Inflow = 4.12 cfs @ 12.14 hrs, Volume= 12,729 cf
Outflow = 0.19 cfs @ 16.27 hrs, Volume= 1,791 cf, Atten= 95%, Lag= 247.5 min
Primary = 0.19 cfs @ 16.27 hrs, Volume= 1,791 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,665.50' @ 16.25 hrs Surf.Area= 5,511 sf Storage= 10,944 cf

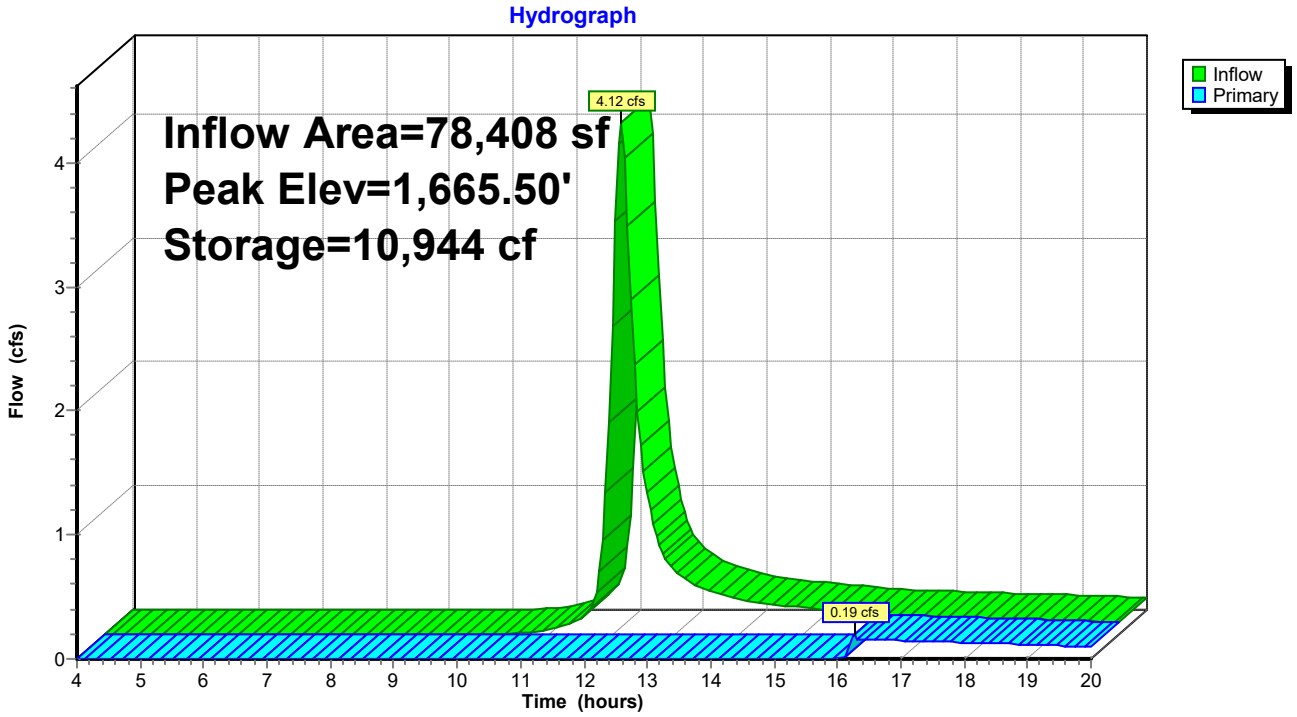
Plug-Flow detention time= 366.5 min calculated for 1,791 cf (14% of inflow)
Center-of-Mass det. time= 265.7 min (1,077.7 - 812.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,662.00'	13,877 cf	**8.00'W x 125.00'L x 4.00'H Prismatoid Z=4.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,665.50'	**180.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.06 cfs @ 16.27 hrs HW=1,665.50' (Free Discharge)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.06 cfs @ 0.15 fps)

Pond 5P: Swale1



Hydrograph for Pond 5P: Swale1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0	1,662.00	0.00
4.50	0.00	0	1,662.00	0.00
5.00	0.00	0	1,662.00	0.00
5.50	0.00	0	1,662.00	0.00
6.00	0.00	0	1,662.00	0.00
6.50	0.00	0	1,662.00	0.00
7.00	0.00	0	1,662.00	0.00
7.50	0.00	0	1,662.00	0.00
8.00	0.00	0	1,662.00	0.00
8.50	0.00	0	1,662.00	0.00
9.00	0.00	0	1,662.00	0.00
9.50	0.00	0	1,662.00	0.00
10.00	0.00	0	1,662.00	0.00
10.50	0.01	2	1,662.00	0.00
11.00	0.04	40	1,662.04	0.00
11.50	0.12	173	1,662.16	0.00
12.00	**2.48**	1,344	1,662.90	0.00
12.50	**1.31**	6,495	1,664.58	0.00
13.00	0.51	7,900	1,664.90	0.00
13.50	0.36	8,661	1,665.06	0.00
14.00	0.29	9,240	1,665.18	0.00
14.50	0.24	9,705	1,665.27	0.00
15.00	0.22	10,115	1,665.35	0.00
15.50	0.20	10,486	1,665.42	0.00
16.00	0.17	**10,817**	**1,665.48**	**0.00**
16.50	0.16	**10,942**	**1,665.50**	**0.16**
17.00	0.15	10,942	1,665.50	0.15
17.50	0.14	10,941	1,665.50	0.14
18.00	0.13	10,940	1,665.50	0.13
18.50	0.12	10,940	1,665.50	0.12
19.00	0.12	10,939	1,665.50	0.12
19.50	0.11	10,939	1,665.50	0.11
20.00	0.10	10,938	1,665.50	0.10

Stage-Discharge for Pond 5P: Swale1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,662.00	0.00	1,663.02	0.00	1,664.04	0.00	1,665.06	0.00
1,662.02	0.00	1,663.04	0.00	1,664.06	0.00	1,665.08	0.00
1,662.04	0.00	1,663.06	0.00	1,664.08	0.00	1,665.10	0.00
1,662.06	0.00	1,663.08	0.00	1,664.10	0.00	1,665.12	0.00
1,662.08	0.00	1,663.10	0.00	1,664.12	0.00	1,665.14	0.00
1,662.10	0.00	1,663.12	0.00	1,664.14	0.00	1,665.16	0.00
1,662.12	0.00	1,663.14	0.00	1,664.16	0.00	1,665.18	0.00
1,662.14	0.00	1,663.16	0.00	1,664.18	0.00	1,665.20	0.00
1,662.16	0.00	1,663.18	0.00	1,664.20	0.00	1,665.22	0.00
1,662.18	0.00	1,663.20	0.00	1,664.22	0.00	1,665.24	0.00
1,662.20	0.00	1,663.22	0.00	1,664.24	0.00	1,665.26	0.00
1,662.22	0.00	1,663.24	0.00	1,664.26	0.00	1,665.28	0.00
1,662.24	0.00	1,663.26	0.00	1,664.28	0.00	1,665.30	0.00
1,662.26	0.00	1,663.28	0.00	1,664.30	0.00	1,665.32	0.00
1,662.28	0.00	1,663.30	0.00	1,664.32	0.00	1,665.34	0.00
1,662.30	0.00	1,663.32	0.00	1,664.34	0.00	1,665.36	0.00
1,662.32	0.00	1,663.34	0.00	1,664.36	0.00	1,665.38	0.00
1,662.34	0.00	1,663.36	0.00	1,664.38	0.00	1,665.40	0.00
1,662.36	0.00	1,663.38	0.00	1,664.40	0.00	1,665.42	0.00
1,662.38	0.00	1,663.40	0.00	1,664.42	0.00	1,665.44	0.00
1,662.40	0.00	1,663.42	0.00	1,664.44	0.00	1,665.46	0.00
1,662.42	0.00	1,663.44	0.00	1,664.46	0.00	1,665.48	0.00
1,662.44	0.00	1,663.46	0.00	1,664.48	0.00	1,665.50	0.00
1,662.46	0.00	1,663.48	0.00	1,664.50	0.00	1,665.52	1.66
1,662.48	0.00	1,663.50	0.00	1,664.52	0.00	1,665.54	4.71
1,662.50	0.00	1,663.52	0.00	1,664.54	0.00	1,665.56	8.65
1,662.52	0.00	1,663.54	0.00	1,664.56	0.00	1,665.58	13.32
1,662.54	0.00	1,663.56	0.00	1,664.58	0.00	1,665.60	18.61
1,662.56	0.00	1,663.58	0.00	1,664.60	0.00	1,665.62	24.46
1,662.58	0.00	1,663.60	0.00	1,664.62	0.00	1,665.64	30.83
1,662.60	0.00	1,663.62	0.00	1,664.64	0.00	1,665.66	37.66
1,662.62	0.00	1,663.64	0.00	1,664.66	0.00	1,665.68	44.94
1,662.64	0.00	1,663.66	0.00	1,664.68	0.00	1,665.70	52.63
1,662.66	0.00	1,663.68	0.00	1,664.70	0.00	1,665.72	60.72
1,662.68	0.00	1,663.70	0.00	1,664.72	0.00	1,665.74	69.19
1,662.70	0.00	1,663.72	0.00	1,664.74	0.00	1,665.76	78.01
1,662.72	0.00	1,663.74	0.00	1,664.76	0.00	1,665.78	87.18
1,662.74	0.00	1,663.76	0.00	1,664.78	0.00	1,665.80	96.68
1,662.76	0.00	1,663.78	0.00	1,664.80	0.00	1,665.82	106.51
1,662.78	0.00	1,663.80	0.00	1,664.82	0.00	1,665.84	116.65
1,662.80	0.00	1,663.82	0.00	1,664.84	0.00	1,665.86	127.09
1,662.82	0.00	1,663.84	0.00	1,664.86	0.00	1,665.88	137.82
1,662.84	0.00	1,663.86	0.00	1,664.88	0.00	1,665.90	148.84
1,662.86	0.00	1,663.88	0.00	1,664.90	0.00	1,665.92	160.14
1,662.88	0.00	1,663.90	0.00	1,664.92	0.00	1,665.94	171.71
1,662.90	0.00	1,663.92	0.00	1,664.94	0.00	1,665.96	183.54
1,662.92	0.00	1,663.94	0.00	1,664.96	0.00	1,665.98	195.64
1,662.94	0.00	1,663.96	0.00	1,664.98	0.00	1,666.00	**207.99**
1,662.96	0.00	1,663.98	0.00	1,665.00	0.00		
1,662.98	0.00	1,664.00	0.00	1,665.02	0.00		
1,663.00	0.00	1,664.02	0.00	1,665.04	0.00		

Stage-Area-Storage for Pond 5P: Swale1

Elevation (feet)	Storage (cubic-feet)
1,662.00	0
1,662.05	51
1,662.10	105
1,662.15	162
1,662.20	221
1,662.25	284
1,662.30	348
1,662.35	416
1,662.40	486
1,662.45	560
1,662.50	636
1,662.55	714
1,662.60	796
1,662.65	881
1,662.70	968
1,662.75	1,058
1,662.80	1,151
1,662.85	1,247
1,662.90	1,346
1,662.95	1,448
1,663.00	1,553
1,663.05	1,661
1,663.10	1,772
1,663.15	1,886
1,663.20	2,003
1,663.25	2,123
1,663.30	2,246
1,663.35	2,372
1,663.40	2,501
1,663.45	2,634
1,663.50	2,769
1,663.55	2,908
1,663.60	3,049
1,663.65	3,194
1,663.70	3,342
1,663.75	3,494
1,663.80	3,648
1,663.85	3,806
1,663.90	3,967
1,663.95	4,131
1,664.00	4,299
1,664.05	4,470
1,664.10	4,644
1,664.15	4,821
1,664.20	5,002
1,664.25	5,186
1,664.30	5,374
1,664.35	5,565
1,664.40	5,759
1,664.45	5,957
1,664.50	6,158
1,664.55	6,363
1,664.60	6,571
1,664.65	6,783
1,664.70	6,998
1,664.75	7,217
1,664.80	7,439
1,664.85	7,665
1,664.90	7,894
1,664.95	8,127
1,665.00	8,364
1,665.05	8,604
1,665.10	8,848
1,665.15	9,096
1,665.20	9,347
1,665.25	9,602
1,665.30	9,860
1,665.35	10,122
1,665.40	10,388
1,665.45	10,658
1,665.50	10,932
1,665.55	11,209
1,665.60	11,490
1,665.65	11,775
1,665.70	12,064
1,665.75	12,356
1,665.80	12,653
1,665.85	12,953
1,665.90	13,257
1,665.95	13,565
1,666.00	**13,877**

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area = 91,607 sf, 0.00% Impervious, Inflow Depth > 1.87" for 100-yr event
Inflow = 5.07 cfs @ 12.11 hrs, Volume= 14,288 cf
Outflow = 1.75 cfs @ 12.40 hrs, Volume= 7,873 cf, Atten= 66%, Lag= 17.4 min
Primary = 1.75 cfs @ 12.40 hrs, Volume= 7,873 cf

Routing by Stor-Ind method, Time Span= 4.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,684.53' @ 12.40 hrs Surf.Area= 0.111 ac Storage= 0.151 af

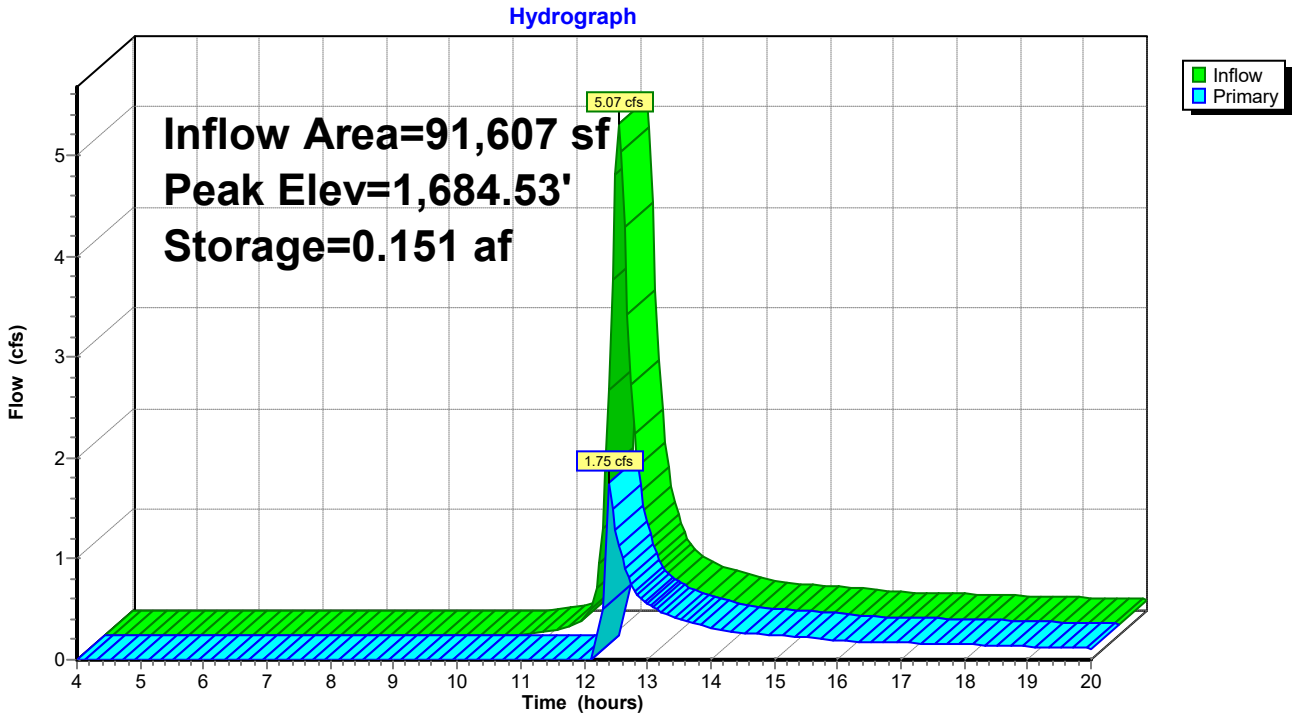
Plug-Flow detention time= 155.5 min calculated for 7,849 cf (55% of inflow)
Center-of-Mass det. time= 72.6 min (884.1 - 811.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,683.00'	0.159 af	**25.00'W x 150.00'L x 1.60'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,684.50'	**150.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=1.69 cfs @ 12.40 hrs HW=1,684.53' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 1.69 cfs @ 0.42 fps)

Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
4.00	0.00	0.000	1,683.00	0.00
4.50	0.00	0.000	1,683.00	0.00
5.00	0.00	0.000	1,683.00	0.00
5.50	0.00	0.000	1,683.00	0.00
6.00	0.00	0.000	1,683.00	0.00
6.50	0.00	0.000	1,683.00	0.00
7.00	0.00	0.000	1,683.00	0.00
7.50	0.00	0.000	1,683.00	0.00
8.00	0.00	0.000	1,683.00	0.00
8.50	0.00	0.000	1,683.00	0.00
9.00	0.00	0.000	1,683.00	0.00
9.50	0.00	0.000	1,683.00	0.00
10.00	0.00	0.000	1,683.00	0.00
10.50	0.00	0.000	1,683.00	0.00
11.00	0.04	0.001	1,683.01	0.00
11.50	0.14	0.004	1,683.05	0.00
12.00	**3.53**	**0.041**	**1,683.46**	**0.00**
12.50	**1.23**	**0.150**	**1,684.52**	**1.29**
13.00	0.54	0.149	1,684.51	0.55
13.50	0.40	0.149	1,684.51	0.41
14.00	0.32	0.148	1,684.51	0.32
14.50	0.27	0.148	1,684.51	0.27
15.00	0.24	0.148	1,684.51	0.25
15.50	0.22	0.148	1,684.51	0.22
16.00	0.19	0.148	1,684.51	0.20
16.50	0.18	0.148	1,684.51	0.18
17.00	0.17	0.148	1,684.51	0.17
17.50	0.16	0.148	1,684.51	0.16
18.00	0.15	0.148	1,684.50	0.15
18.50	0.14	0.148	1,684.50	0.14
19.00	0.13	0.148	1,684.50	0.13
19.50	0.12	0.148	1,684.50	0.12
20.00	0.11	0.148	1,684.50	0.11

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

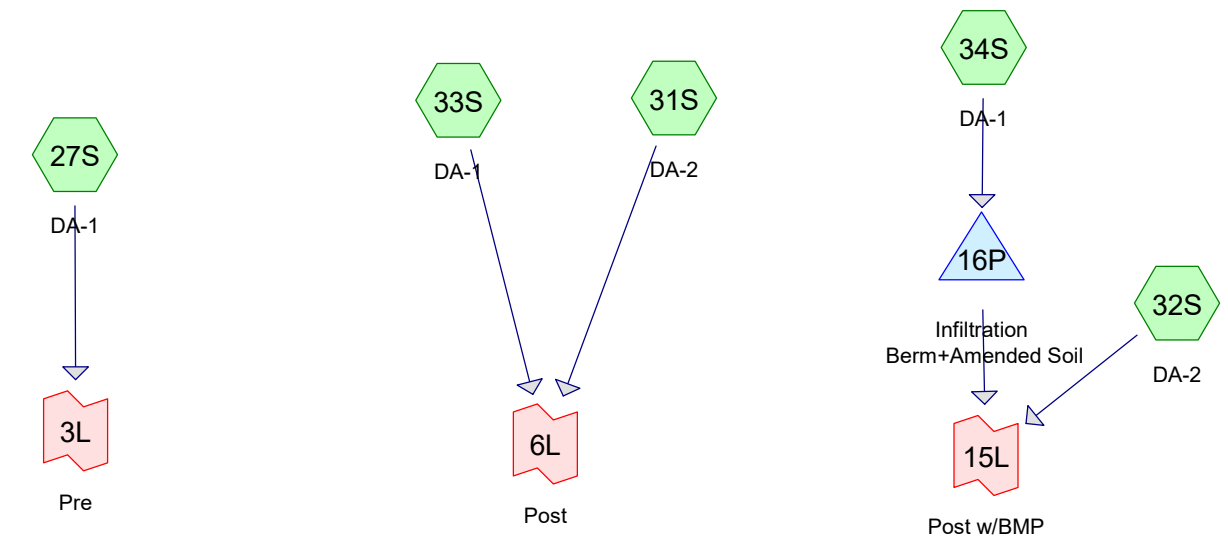
Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,683.00	0.00	1,683.51	0.00	1,684.02	0.00	1,684.53	1.98
1,683.01	0.00	1,683.52	0.00	1,684.03	0.00	1,684.54	3.05
1,683.02	0.00	1,683.53	0.00	1,684.04	0.00	1,684.55	4.26
1,683.03	0.00	1,683.54	0.00	1,684.05	0.00	1,684.56	5.60
1,683.04	0.00	1,683.55	0.00	1,684.06	0.00	1,684.57	7.06
1,683.05	0.00	1,683.56	0.00	1,684.07	0.00	1,684.58	8.62
1,683.06	0.00	1,683.57	0.00	1,684.08	0.00	1,684.59	10.29
1,683.07	0.00	1,683.58	0.00	1,684.09	0.00	1,684.60	**12.05**
1,683.08	0.00	1,683.59	0.00	1,684.10	0.00		
1,683.09	0.00	1,683.60	0.00	1,684.11	0.00		
1,683.10	0.00	1,683.61	0.00	1,684.12	0.00		
1,683.11	0.00	1,683.62	0.00	1,684.13	0.00		
1,683.12	0.00	1,683.63	0.00	1,684.14	0.00		
1,683.13	0.00	1,683.64	0.00	1,684.15	0.00		
1,683.14	0.00	1,683.65	0.00	1,684.16	0.00		
1,683.15	0.00	1,683.66	0.00	1,684.17	0.00		
1,683.16	0.00	1,683.67	0.00	1,684.18	0.00		
1,683.17	0.00	1,683.68	0.00	1,684.19	0.00		
1,683.18	0.00	1,683.69	0.00	1,684.20	0.00		
1,683.19	0.00	1,683.70	0.00	1,684.21	0.00		
1,683.20	0.00	1,683.71	0.00	1,684.22	0.00		
1,683.21	0.00	1,683.72	0.00	1,684.23	0.00		
1,683.22	0.00	1,683.73	0.00	1,684.24	0.00		
1,683.23	0.00	1,683.74	0.00	1,684.25	0.00		
1,683.24	0.00	1,683.75	0.00	1,684.26	0.00		
1,683.25	0.00	1,683.76	0.00	1,684.27	0.00		
1,683.26	0.00	1,683.77	0.00	1,684.28	0.00		
1,683.27	0.00	1,683.78	0.00	1,684.29	0.00		
1,683.28	0.00	1,683.79	0.00	1,684.30	0.00		
1,683.29	0.00	1,683.80	0.00	1,684.31	0.00		
1,683.30	0.00	1,683.81	0.00	1,684.32	0.00		
1,683.31	0.00	1,683.82	0.00	1,684.33	0.00		
1,683.32	0.00	1,683.83	0.00	1,684.34	0.00		
1,683.33	0.00	1,683.84	0.00	1,684.35	0.00		
1,683.34	0.00	1,683.85	0.00	1,684.36	0.00		
1,683.35	0.00	1,683.86	0.00	1,684.37	0.00		
1,683.36	0.00	1,683.87	0.00	1,684.38	0.00		
1,683.37	0.00	1,683.88	0.00	1,684.39	0.00		
1,683.38	0.00	1,683.89	0.00	1,684.40	0.00		
1,683.39	0.00	1,683.90	0.00	1,684.41	0.00		
1,683.40	0.00	1,683.91	0.00	1,684.42	0.00		
1,683.41	0.00	1,683.92	0.00	1,684.43	0.00		
1,683.42	0.00	1,683.93	0.00	1,684.44	0.00		
1,683.43	0.00	1,683.94	0.00	1,684.45	0.00		
1,683.44	0.00	1,683.95	0.00	1,684.46	0.00		
1,683.45	0.00	1,683.96	0.00	1,684.47	0.00		
1,683.46	0.00	1,683.97	0.00	1,684.48	0.00		
1,683.47	0.00	1,683.98	0.00	1,684.49	0.00		
1,683.48	0.00	1,683.99	0.00	1,684.50	0.00		
1,683.49	0.00	1,684.00	0.00	1,684.51	0.38		
1,683.50	0.00	1,684.01	0.00	1,684.52	1.08		

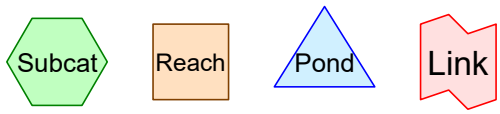
Stage-Area-Storage for Pond 16P: Infiltration Berm+Amended Soil

Elevation (feet)	Storage (acre-feet)
1,683.00	0.000
1,683.02	0.002
1,683.04	0.003
1,683.06	0.005
1,683.08	0.007
1,683.10	0.009
1,683.12	0.010
1,683.14	0.012
1,683.16	0.014
1,683.18	0.016
1,683.20	0.018
1,683.22	0.019
1,683.24	0.021
1,683.26	0.023
1,683.28	0.025
1,683.30	0.027
1,683.32	0.028
1,683.34	0.030
1,683.36	0.032
1,683.38	0.034
1,683.40	0.036
1,683.42	0.038
1,683.44	0.039
1,683.46	0.041
1,683.48	0.043
1,683.50	0.045
1,683.52	0.047
1,683.54	0.049
1,683.56	0.051
1,683.58	0.053
1,683.60	0.055
1,683.62	0.056
1,683.64	0.058
1,683.66	0.060
1,683.68	0.062
1,683.70	0.064
1,683.72	0.066
1,683.74	0.068
1,683.76	0.070
1,683.78	0.072
1,683.80	0.074
1,683.82	0.076
1,683.84	0.078
1,683.86	0.080
1,683.88	0.082
1,683.90	0.084
1,683.92	0.086
1,683.94	0.088
1,683.96	0.090
1,683.98	0.092
1,684.00	0.094
1,684.02	0.096
1,684.04	0.098
1,684.06	0.100
1,684.08	0.103
1,684.10	0.105
1,684.12	0.107
1,684.14	0.109
1,684.16	0.111
1,684.18	0.113
1,684.20	0.115
1,684.22	0.117
1,684.24	0.119
1,684.26	0.121
1,684.28	0.124
1,684.30	0.126
1,684.32	0.128
1,684.34	0.130
1,684.36	0.132
1,684.38	0.134
1,684.40	0.137
1,684.42	0.139
1,684.44	0.141
1,684.46	0.143
1,684.48	0.145
1,684.50	0.148
1,684.52	0.150
1,684.54	0.152
1,684.56	0.154
1,684.58	0.157
1,684.60	**0.159**

ATTACHMENT 4.8

HYDROCAD REPORT-
WESTERN TERMINUS MLV





Routing Diagram for Western Terminus HydroCAD Final
Prepared by {enter your company name here}, Printed 5/14/2020
HydroCAD® 10.00-25 s/n 09710 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.779	58	Meadow, non-grazed, HSG B (27S, 33S, 34S)
0.050	71	Meadow, non-grazed, HSG C (31S, 32S)
1.660	89	Paved roads w/open ditches, 50% imp, HSG B (27S, 33S, 34S)
14.255	60	Woods, Fair, HSG B (27S, 31S, 32S, 33S, 34S)
20.744	**62**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
20.694	HSG B	27S, 31S, 32S, 33S, 34S
0.050	HSG C	31S, 32S
0.000	HSG D	
0.000	Other	
20.744		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatch Numbers
0.000	4.779	0.050	0.000	0.000	4.829	Meadow, non-grazed	
0.000	1.660	0.000	0.000	0.000	1.660	Paved roads w/open ditches, 50% imp	
0.000	14.255	0.000	0.000	0.000	14.255	Woods, Fair	
0.000	**20.694**	**0.050**	**0.000**	**0.000**	**20.744**	**TOTAL AREA**	

Time span=5.00-30.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 27S: DA-1 Runoff Area=301,436 sf 3.63% Impervious Runoff Depth=0.22"
Flow Length=860' Tc=10.4 min CN=61 Runoff=1.09 cfs 0.127 af

Subcatchment 31S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=0.20"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=0.43 cfs 0.035 af

Subcatchment 32S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=0.20"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=0.43 cfs 0.035 af

Subcatchment 33S: DA-1 Runoff Area=206,910 sf 6.09% Impervious Runoff Depth=0.27"
Flow Length=439' Tc=7.1 min CN=63 Runoff=1.42 cfs 0.107 af

Subcatchment 34S: DA-1 Runoff Area=206,911 sf 6.09% Impervious Runoff Depth=0.27"
Flow Length=439' Tc=7.1 min CN=63 Runoff=1.42 cfs 0.107 af

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,688.92' Storage=0.107 af Inflow=1.42 cfs 0.107 af
Outflow=0.00 cfs 0.000 af

Link 3L: Pre Inflow=1.09 cfs 0.127 af
Primary=1.09 cfs 0.127 af

Link 6L: Post Inflow=1.77 cfs 0.143 af
Primary=1.77 cfs 0.143 af

Link 15L: Post w/BMP Inflow=0.43 cfs 0.035 af
Primary=0.43 cfs 0.035 af

Total Runoff Area = 20.744 ac Runoff Volume = 0.413 af Average Runoff Depth = 0.24"
96.00% Pervious = 19.914 ac 4.00% Impervious = 0.830 ac

Summary for Subcatchment 27S: DA-1

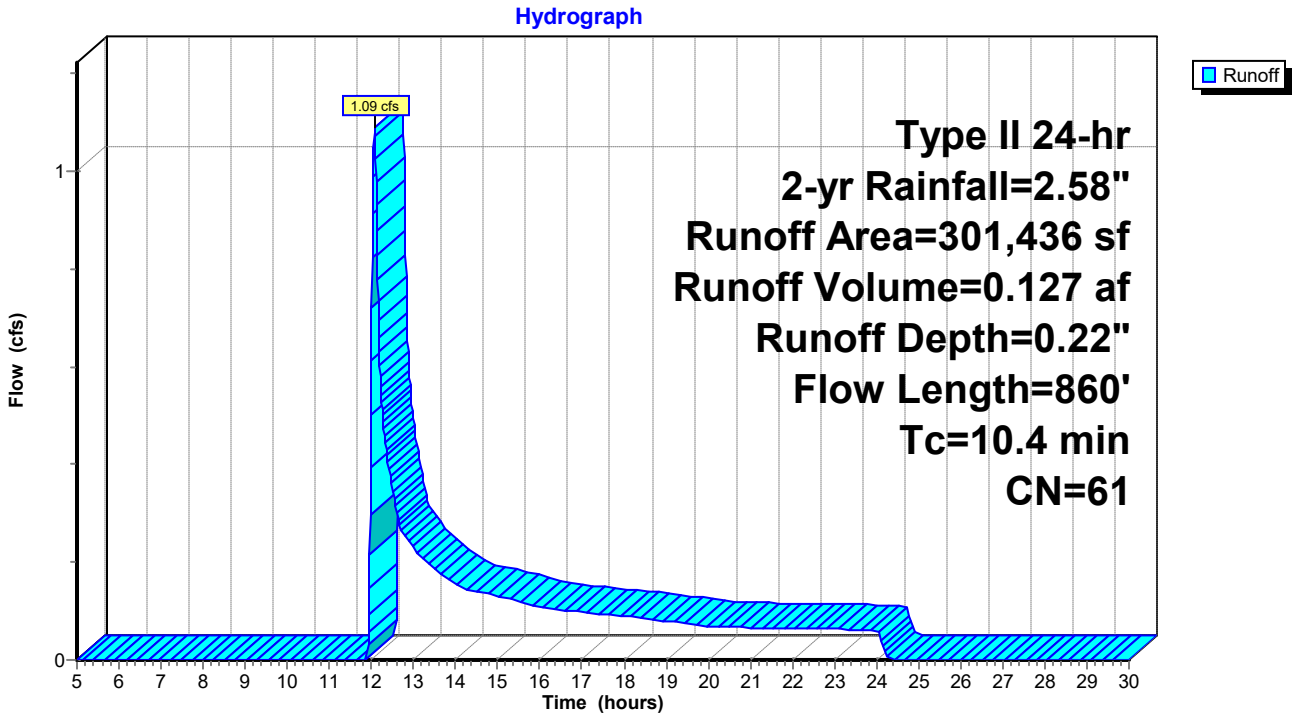
Runoff = 1.09 cfs @ 12.07 hrs, Volume= 0.127 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (sf)	CN	Description
134,617	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
21,900	89	Paved roads w/open ditches, 50% imp, HSG B
301,436	61	Weighted Average
290,486		96.37% Pervious Area
10,950		3.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	860	Total			

Subcatchment 27S: DA-1



Hydrograph for Subcatchment 27S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.16	0.00	0.00
5.50	0.18	0.00	0.00
6.00	0.21	0.00	0.00
6.50	0.23	0.00	0.00
7.00	0.26	0.00	0.00
7.50	0.28	0.00	0.00
8.00	0.31	0.00	0.00
8.50	0.34	0.00	0.00
9.00	0.38	0.00	0.00
9.50	0.42	0.00	0.00
10.00	0.47	0.00	0.00
10.50	0.53	0.00	0.00
11.00	0.61	0.00	0.00
11.50	0.73	0.00	0.00
12.00	1.71	0.03	**0.61**
12.50	1.90	0.05	**0.35**
13.00	1.99	0.07	0.23
13.50	2.06	0.09	0.19
14.00	2.12	0.10	0.16
14.50	2.16	0.11	0.14
15.00	2.20	0.12	0.13
15.50	2.24	0.13	0.12
16.00	2.27	0.13	0.11
16.50	2.30	0.14	0.10
17.00	2.33	0.15	0.10
17.50	2.35	0.15	0.09
18.00	2.38	0.16	0.09
18.50	2.40	0.17	0.08
19.00	2.42	0.17	0.08
19.50	2.44	0.18	0.07
20.00	2.46	0.18	0.07
20.50	2.47	0.19	0.07
21.00	2.49	0.19	0.07
21.50	2.51	0.20	0.07
22.00	2.52	0.20	0.06
22.50	2.54	0.21	0.06
23.00	2.55	0.21	0.06
23.50	2.57	0.22	0.06
24.00	**2.58**	**0.22**	0.06
24.50	2.58	0.22	0.00
25.00	2.58	0.22	0.00
25.50	2.58	0.22	0.00
26.00	2.58	0.22	0.00
26.50	2.58	0.22	0.00
27.00	2.58	0.22	0.00
27.50	2.58	0.22	0.00
28.00	2.58	0.22	0.00
28.50	2.58	0.22	0.00
29.00	2.58	0.22	0.00
29.50	2.58	0.22	0.00
30.00	2.58	0.22	0.00

Summary for Subcatchment 31S: DA-2

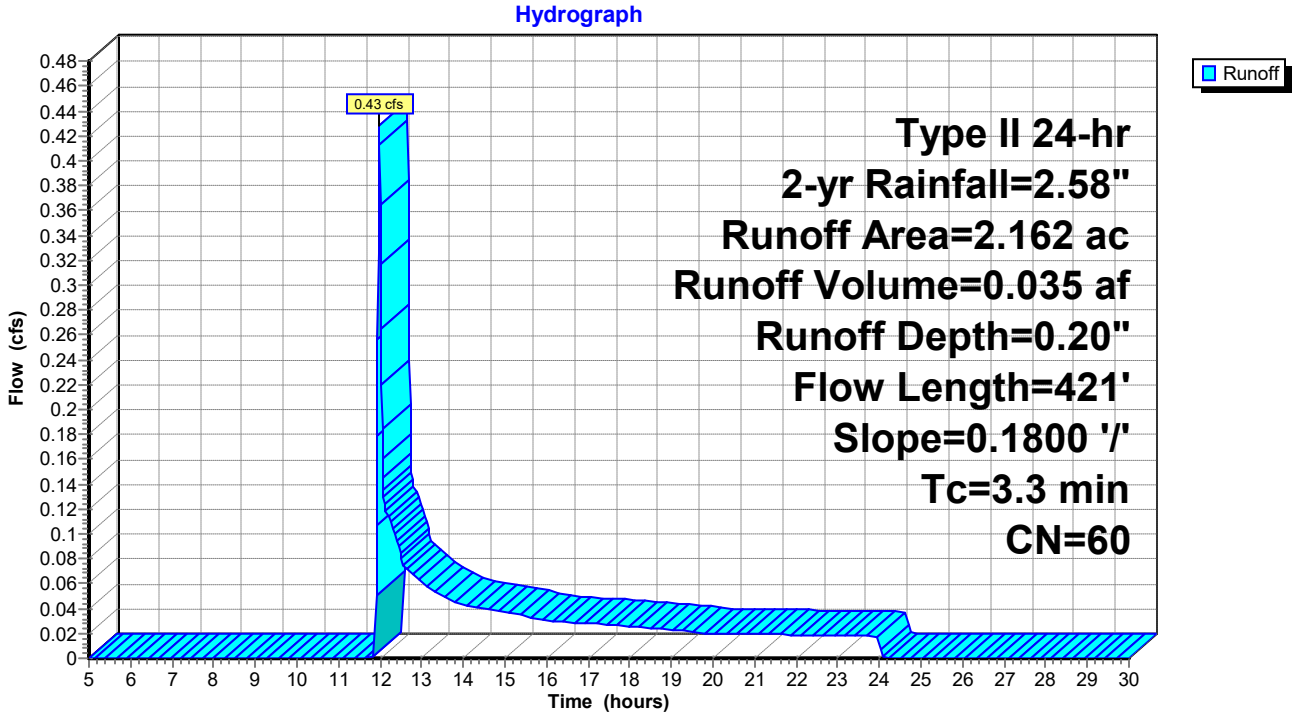
Runoff = 0.43 cfs @ 11.98 hrs, Volume= 0.035 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 31S: DA-2



Hydrograph for Subcatchment 31S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.16	0.00	0.00
5.50	0.18	0.00	0.00
6.00	0.21	0.00	0.00
6.50	0.23	0.00	0.00
7.00	0.26	0.00	0.00
7.50	0.28	0.00	0.00
8.00	0.31	0.00	0.00
8.50	0.34	0.00	0.00
9.00	0.38	0.00	0.00
9.50	0.42	0.00	0.00
10.00	0.47	0.00	0.00
10.50	0.53	0.00	0.00
11.00	0.61	0.00	0.00
11.50	0.73	0.00	**0.00**
12.00	1.71	0.02	**0.40**
12.50	1.90	0.04	0.08
13.00	1.99	0.06	0.06
13.50	2.06	0.07	0.05
14.00	2.12	0.08	0.04
14.50	2.16	0.09	0.04
15.00	2.20	0.10	0.04
15.50	2.24	0.11	0.03
16.00	2.27	0.12	0.03
16.50	2.30	0.12	0.03
17.00	2.33	0.13	0.03
17.50	2.35	0.14	0.03
18.00	2.38	0.14	0.03
18.50	2.40	0.15	0.02
19.00	2.42	0.15	0.02
19.50	2.44	0.16	0.02
20.00	2.46	0.16	0.02
20.50	2.47	0.17	0.02
21.00	2.49	0.17	0.02
21.50	2.51	0.18	0.02
22.00	2.52	0.18	0.02
22.50	2.54	0.18	0.02
23.00	2.55	0.19	0.02
23.50	2.57	0.19	0.02
24.00	**2.58**	**0.20**	0.02
24.50	2.58	0.20	0.00
25.00	2.58	0.20	0.00
25.50	2.58	0.20	0.00
26.00	2.58	0.20	0.00
26.50	2.58	0.20	0.00
27.00	2.58	0.20	0.00
27.50	2.58	0.20	0.00
28.00	2.58	0.20	0.00
28.50	2.58	0.20	0.00
29.00	2.58	0.20	0.00
29.50	2.58	0.20	0.00
30.00	2.58	0.20	0.00

Summary for Subcatchment 32S: DA-2

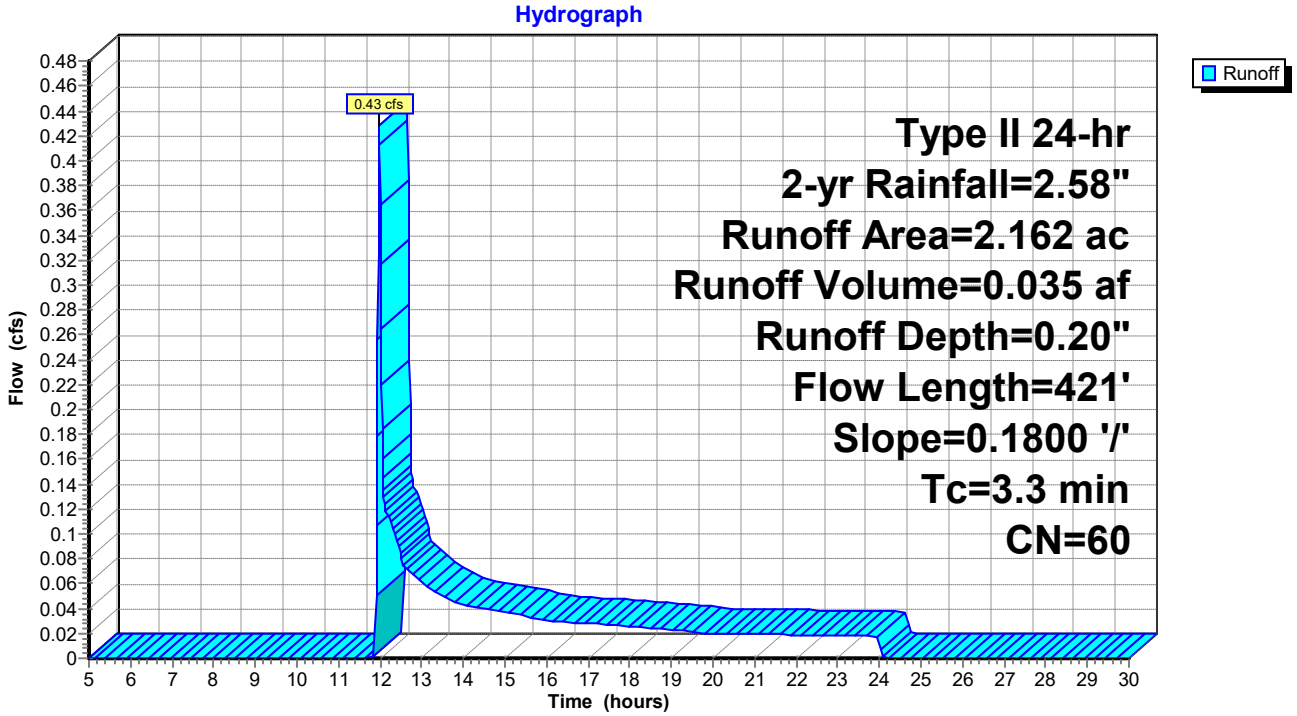
Runoff = 0.43 cfs @ 11.98 hrs, Volume= 0.035 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 32S: DA-2



Hydrograph for Subcatchment 32S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.16	0.00	0.00
5.50	0.18	0.00	0.00
6.00	0.21	0.00	0.00
6.50	0.23	0.00	0.00
7.00	0.26	0.00	0.00
7.50	0.28	0.00	0.00
8.00	0.31	0.00	0.00
8.50	0.34	0.00	0.00
9.00	0.38	0.00	0.00
9.50	0.42	0.00	0.00
10.00	0.47	0.00	0.00
10.50	0.53	0.00	0.00
11.00	0.61	0.00	0.00
11.50	0.73	0.00	**0.00**
12.00	1.71	0.02	**0.40**
12.50	1.90	0.04	0.08
13.00	1.99	0.06	0.06
13.50	2.06	0.07	0.05
14.00	2.12	0.08	0.04
14.50	2.16	0.09	0.04
15.00	2.20	0.10	0.04
15.50	2.24	0.11	0.03
16.00	2.27	0.12	0.03
16.50	2.30	0.12	0.03
17.00	2.33	0.13	0.03
17.50	2.35	0.14	0.03
18.00	2.38	0.14	0.03
18.50	2.40	0.15	0.02
19.00	2.42	0.15	0.02
19.50	2.44	0.16	0.02
20.00	2.46	0.16	0.02
20.50	2.47	0.17	0.02
21.00	2.49	0.17	0.02
21.50	2.51	0.18	0.02
22.00	2.52	0.18	0.02
22.50	2.54	0.18	0.02
23.00	2.55	0.19	0.02
23.50	2.57	0.19	0.02
24.00	**2.58**	**0.20**	0.02
24.50	2.58	0.20	0.00
25.00	2.58	0.20	0.00
25.50	2.58	0.20	0.00
26.00	2.58	0.20	0.00
26.50	2.58	0.20	0.00
27.00	2.58	0.20	0.00
27.50	2.58	0.20	0.00
28.00	2.58	0.20	0.00
28.50	2.58	0.20	0.00
29.00	2.58	0.20	0.00
29.50	2.58	0.20	0.00
30.00	2.58	0.20	0.00

Summary for Subcatchment 33S: DA-1

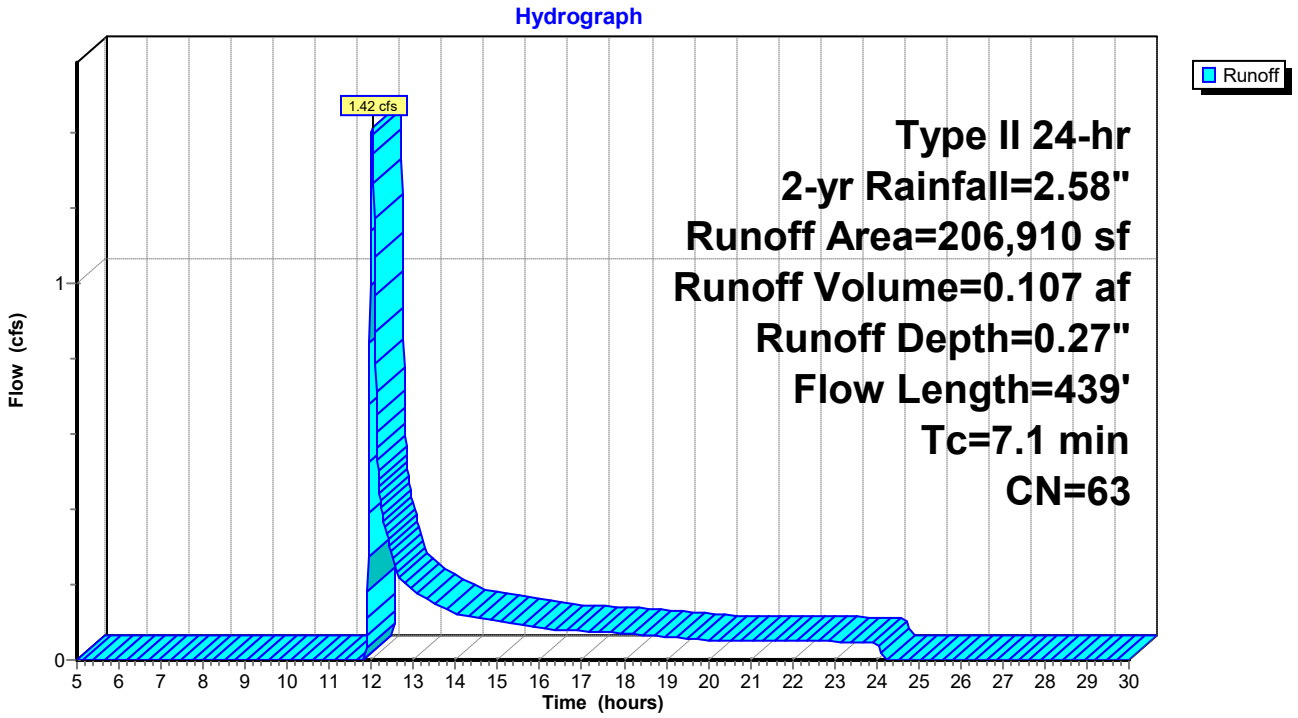
Runoff = 1.42 cfs @ 12.02 hrs, Volume= 0.107 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (sf)	CN	Description
36,765	58	Meadow, non-grazed, HSG B
144,924	60	Woods, Fair, HSG B
25,221	89	Paved roads w/open ditches, 50% imp, HSG B
206,910	63	Weighted Average
194,300		93.91% Pervious Area
12,611		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 33S: DA-1



Hydrograph for Subcatchment 33S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.16	0.00	0.00
5.50	0.18	0.00	0.00
6.00	0.21	0.00	0.00
6.50	0.23	0.00	0.00
7.00	0.26	0.00	0.00
7.50	0.28	0.00	0.00
8.00	0.31	0.00	0.00
8.50	0.34	0.00	0.00
9.00	0.38	0.00	0.00
9.50	0.42	0.00	0.00
10.00	0.47	0.00	0.00
10.50	0.53	0.00	0.00
11.00	0.61	0.00	0.00
11.50	0.73	0.00	0.00
12.00	1.71	0.04	**1.35**
12.50	1.90	0.08	**0.28**
13.00	1.99	0.10	0.19
13.50	2.06	0.12	0.15
14.00	2.12	0.13	0.12
14.50	2.16	0.14	0.11
15.00	2.20	0.15	0.10
15.50	2.24	0.16	0.09
16.00	2.27	0.17	0.08
16.50	2.30	0.18	0.08
17.00	2.33	0.19	0.08
17.50	2.35	0.20	0.07
18.00	2.38	0.20	0.07
18.50	2.40	0.21	0.07
19.00	2.42	0.22	0.06
19.50	2.44	0.22	0.06
20.00	2.46	0.23	0.05
20.50	2.47	0.24	0.05
21.00	2.49	0.24	0.05
21.50	2.51	0.25	0.05
22.00	2.52	0.25	0.05
22.50	2.54	0.26	0.05
23.00	2.55	0.26	0.05
23.50	2.57	0.27	0.05
24.00	**2.58**	**0.27**	0.05
24.50	2.58	0.27	0.00
25.00	2.58	0.27	0.00
25.50	2.58	0.27	0.00
26.00	2.58	0.27	0.00
26.50	2.58	0.27	0.00
27.00	2.58	0.27	0.00
27.50	2.58	0.27	0.00
28.00	2.58	0.27	0.00
28.50	2.58	0.27	0.00
29.00	2.58	0.27	0.00
29.50	2.58	0.27	0.00
30.00	2.58	0.27	0.00

Summary for Subcatchment 34S: DA-1

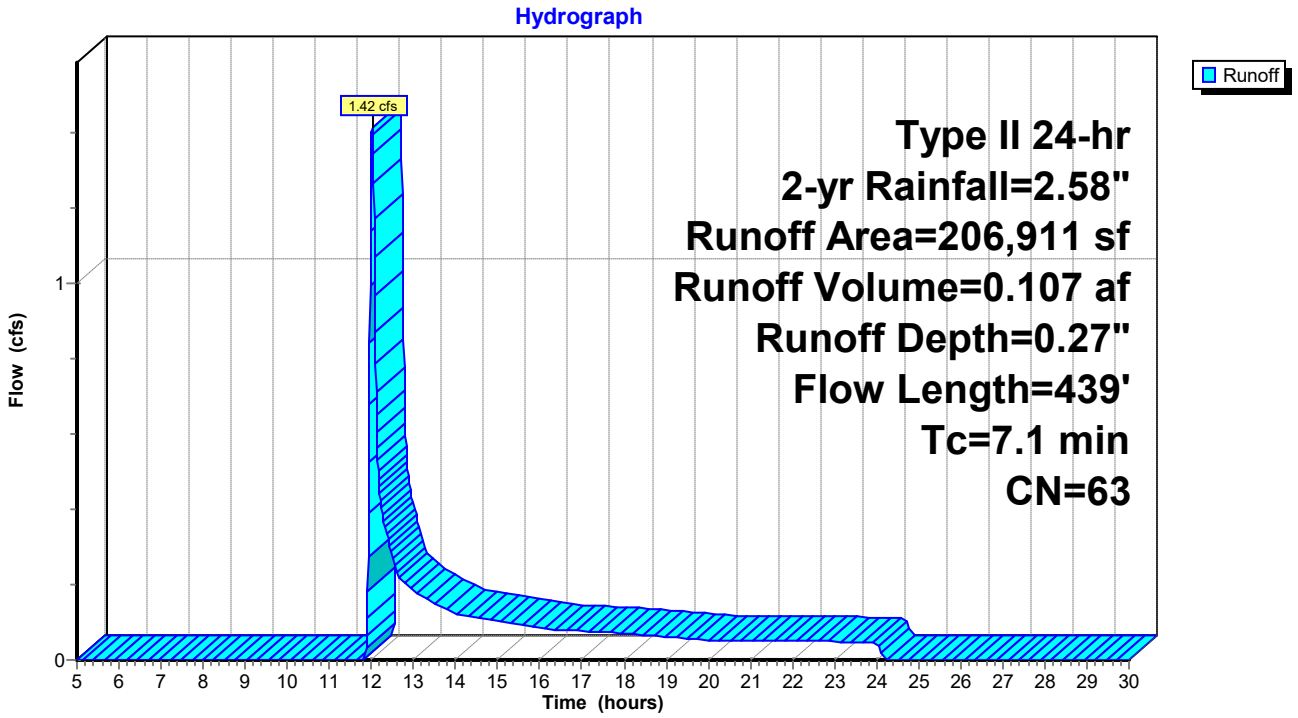
Runoff = 1.42 cfs @ 12.02 hrs, Volume= 0.107 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.58"

Area (sf)	CN	Description
36,785	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
25,207	89	Paved roads w/open ditches, 50% imp, HSG B
206,911	63	Weighted Average
194,308		93.91% Pervious Area
12,604		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 34S: DA-1



Hydrograph for Subcatchment 34S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.16	0.00	0.00
5.50	0.18	0.00	0.00
6.00	0.21	0.00	0.00
6.50	0.23	0.00	0.00
7.00	0.26	0.00	0.00
7.50	0.28	0.00	0.00
8.00	0.31	0.00	0.00
8.50	0.34	0.00	0.00
9.00	0.38	0.00	0.00
9.50	0.42	0.00	0.00
10.00	0.47	0.00	0.00
10.50	0.53	0.00	0.00
11.00	0.61	0.00	0.00
11.50	0.73	0.00	0.00
12.00	1.71	0.04	**1.35**
12.50	1.90	0.08	**0.28**
13.00	1.99	0.10	0.19
13.50	2.06	0.12	0.15
14.00	2.12	0.13	0.12
14.50	2.16	0.14	0.11
15.00	2.20	0.15	0.10
15.50	2.24	0.16	0.09
16.00	2.27	0.17	0.08
16.50	2.30	0.18	0.08
17.00	2.33	0.19	0.08
17.50	2.35	0.20	0.07
18.00	2.38	0.20	0.07
18.50	2.40	0.21	0.07
19.00	2.42	0.22	0.06
19.50	2.44	0.22	0.06
20.00	2.46	0.23	0.05
20.50	2.47	0.24	0.05
21.00	2.49	0.24	0.05
21.50	2.51	0.25	0.05
22.00	2.52	0.25	0.05
22.50	2.54	0.26	0.05
23.00	2.55	0.26	0.05
23.50	2.57	0.27	0.05
24.00	**2.58**	**0.27**	0.05
24.50	2.58	0.27	0.00
25.00	2.58	0.27	0.00
25.50	2.58	0.27	0.00
26.00	2.58	0.27	0.00
26.50	2.58	0.27	0.00
27.00	2.58	0.27	0.00
27.50	2.58	0.27	0.00
28.00	2.58	0.27	0.00
28.50	2.58	0.27	0.00
29.00	2.58	0.27	0.00
29.50	2.58	0.27	0.00
30.00	2.58	0.27	0.00

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area =	4.750 ac,	6.09% Impervious,	Inflow Depth =	0.27"	for 2-yr event
Inflow =	1.42 cfs @	12.02 hrs,	Volume=	0.107 af	
Outflow =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af,	Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,688.92' @ 24.42 hrs Surf.Area= 0.128 ac Storage= 0.107 af

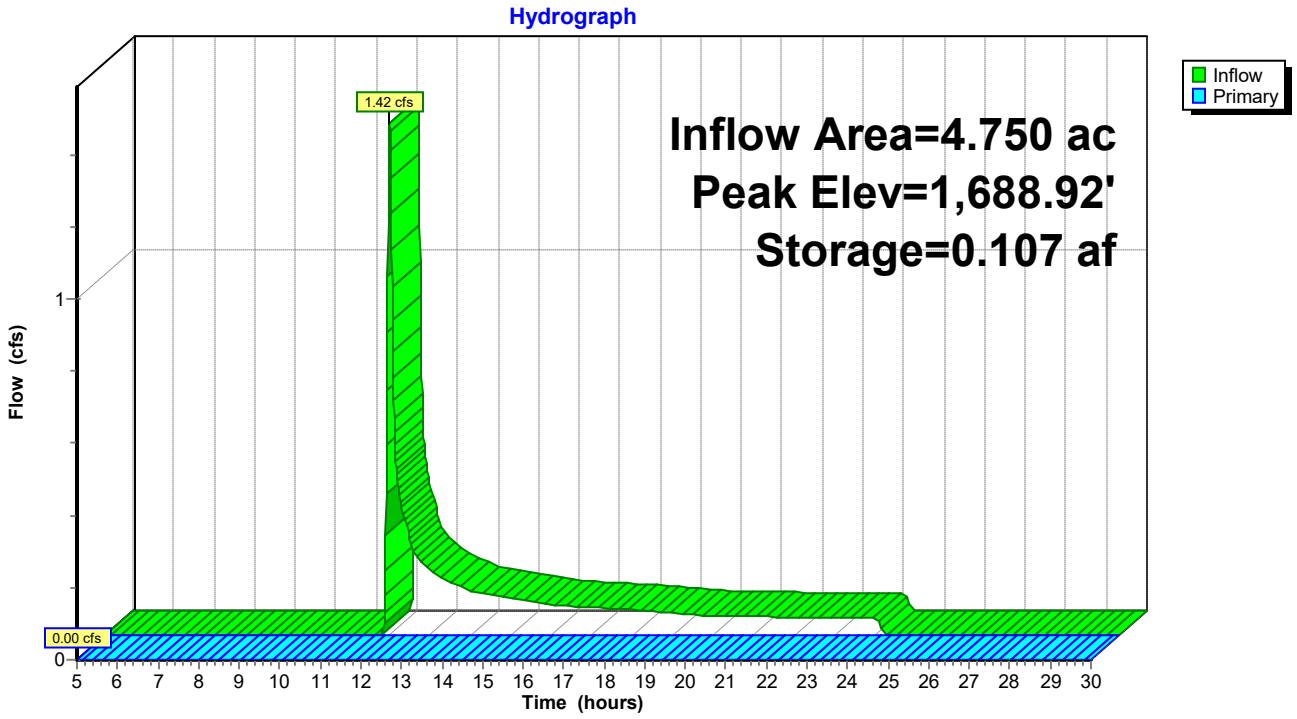
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,688.00'	0.200 af	**20.00'W x 231.00'L x 1.60'H Prismatoid Z=2.0**

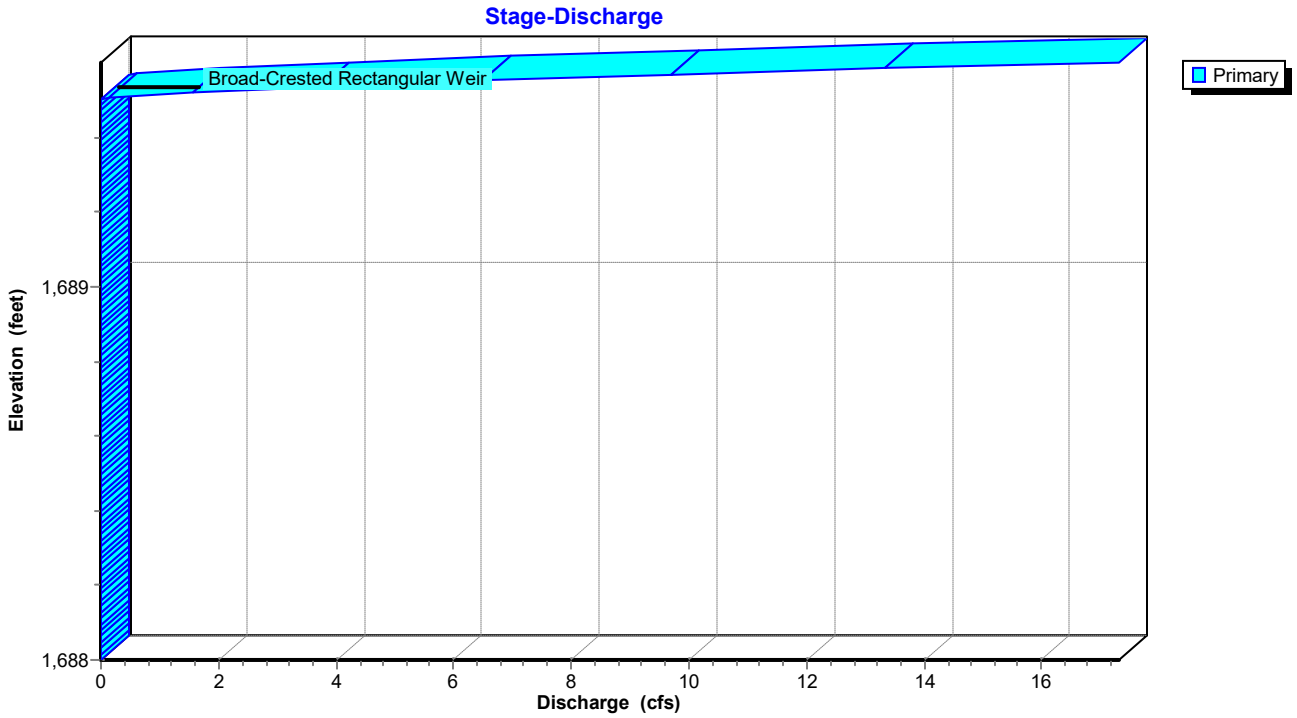
Device	Routing	Invert	Outlet Devices
#1	Primary	1,689.50'	**231.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,688.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

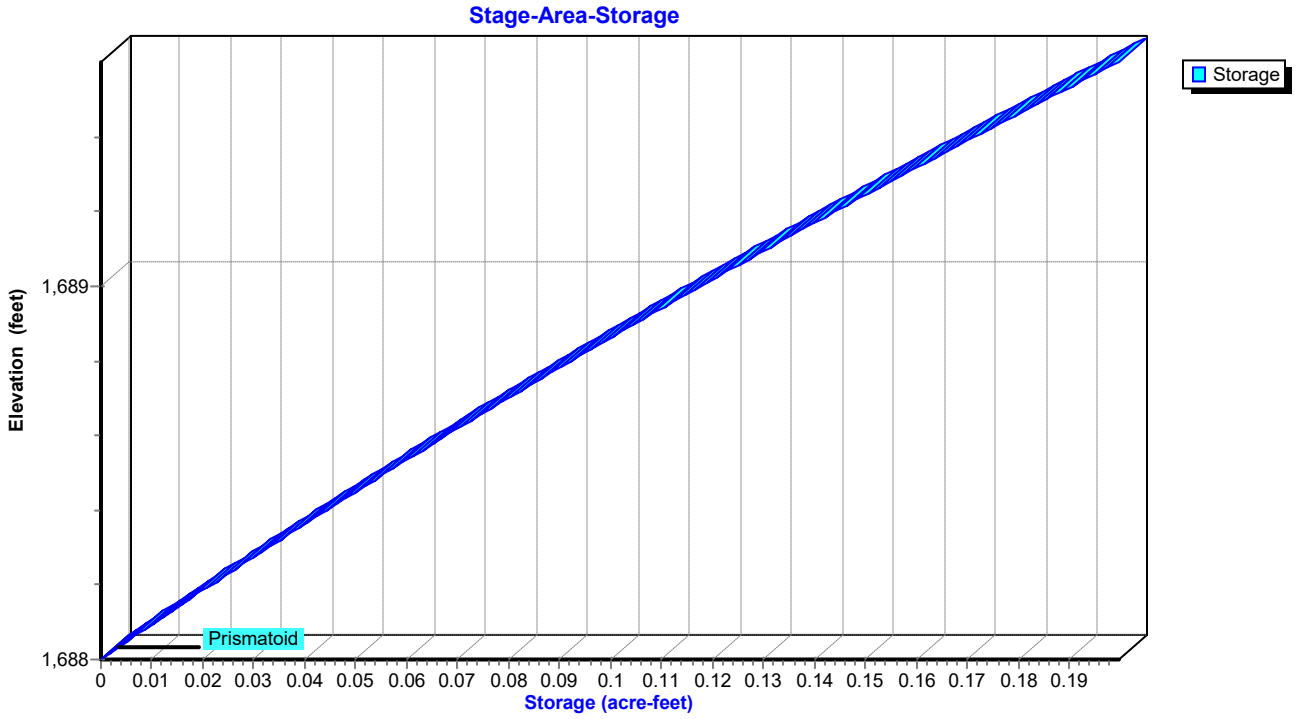
Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0.000	1,688.00	**0.00**
5.50	0.00	0.000	1,688.00	0.00
6.00	0.00	0.000	1,688.00	0.00
6.50	0.00	0.000	1,688.00	0.00
7.00	0.00	0.000	1,688.00	0.00
7.50	0.00	0.000	1,688.00	0.00
8.00	0.00	0.000	1,688.00	0.00
8.50	0.00	0.000	1,688.00	0.00
9.00	0.00	0.000	1,688.00	0.00
9.50	0.00	0.000	1,688.00	0.00
10.00	0.00	0.000	1,688.00	0.00
10.50	0.00	0.000	1,688.00	0.00
11.00	0.00	0.000	1,688.00	0.00
11.50	0.00	0.000	1,688.00	0.00
12.00	**1.35**	0.006	1,688.06	0.00
12.50	**0.28**	0.029	1,688.27	0.00
13.00	0.19	0.038	1,688.34	0.00
13.50	0.15	0.045	1,688.40	0.00
14.00	0.12	0.050	1,688.45	0.00
14.50	0.11	0.055	1,688.49	0.00
15.00	0.10	0.060	1,688.53	0.00
15.50	0.09	0.064	1,688.57	0.00
16.00	0.08	0.067	1,688.60	0.00
16.50	0.08	0.071	1,688.63	0.00
17.00	0.08	0.074	1,688.65	0.00
17.50	0.07	0.077	1,688.68	0.00
18.00	0.07	0.080	1,688.70	0.00
18.50	0.07	0.083	1,688.72	0.00
19.00	0.06	0.086	1,688.75	0.00
19.50	0.06	0.088	1,688.77	0.00
20.00	0.05	0.090	1,688.78	0.00
20.50	0.05	0.093	1,688.80	0.00
21.00	0.05	0.095	1,688.82	0.00
21.50	0.05	0.097	1,688.84	0.00
22.00	0.05	0.099	1,688.85	0.00
22.50	0.05	0.101	1,688.87	0.00
23.00	0.05	0.103	1,688.89	0.00
23.50	0.05	0.105	1,688.90	0.00
24.00	0.05	**0.107**	**1,688.92**	0.00
24.50	0.00	**0.107**	**1,688.92**	0.00
25.00	0.00	0.107	1,688.92	0.00
25.50	0.00	0.107	1,688.92	0.00
26.00	0.00	0.107	1,688.92	0.00
26.50	0.00	0.107	1,688.92	0.00
27.00	0.00	0.107	1,688.92	0.00
27.50	0.00	0.107	1,688.92	0.00
28.00	0.00	0.107	1,688.92	0.00
28.50	0.00	0.107	1,688.92	0.00
29.00	0.00	0.107	1,688.92	0.00
29.50	0.00	0.107	1,688.92	0.00
30.00	0.00	0.107	1,688.92	0.00

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

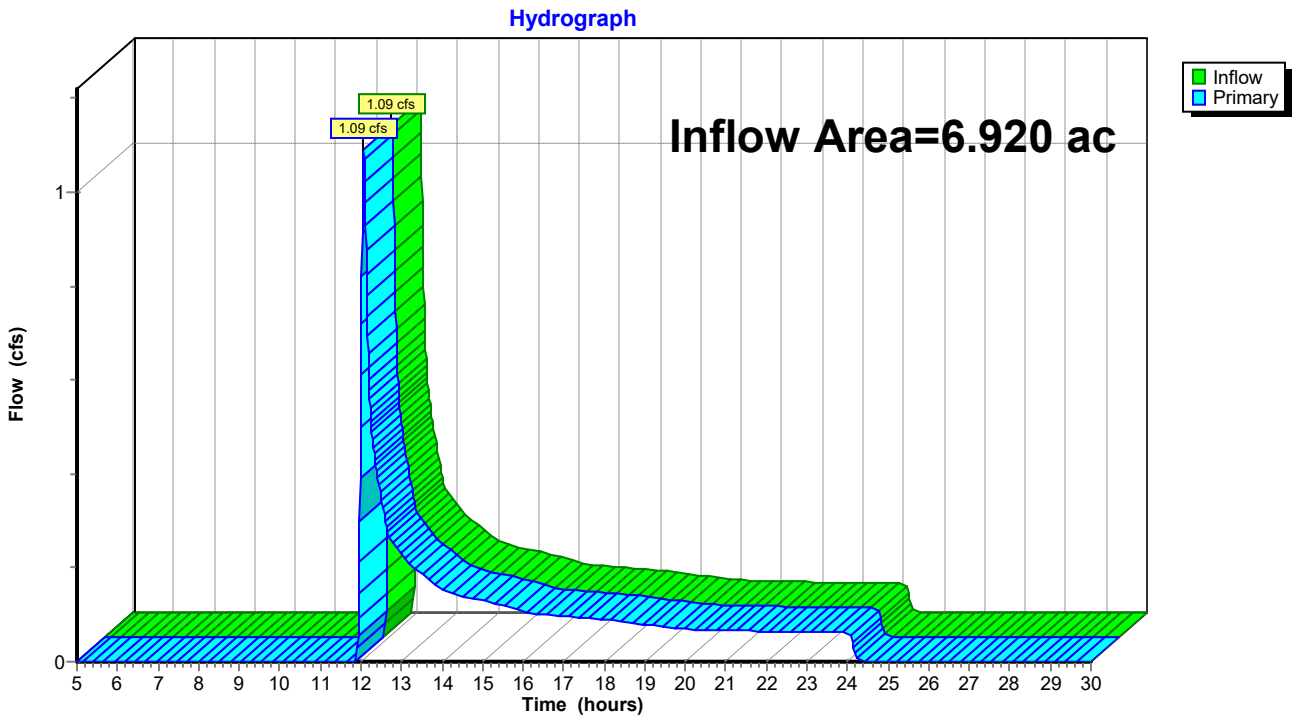
Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,688.00	0.00	1,688.51	0.00	1,689.02	0.00	1,689.53	2.84
1,688.01	0.00	1,688.52	0.00	1,689.03	0.00	1,689.54	4.38
1,688.02	0.00	1,688.53	0.00	1,689.04	0.00	1,689.55	6.12
1,688.03	0.00	1,688.54	0.00	1,689.05	0.00	1,689.56	8.05
1,688.04	0.00	1,688.55	0.00	1,689.06	0.00	1,689.57	10.14
1,688.05	0.00	1,688.56	0.00	1,689.07	0.00	1,689.58	12.39
1,688.06	0.00	1,688.57	0.00	1,689.08	0.00	1,689.59	14.78
1,688.07	0.00	1,688.58	0.00	1,689.09	0.00	1,689.60	**17.31**
1,688.08	0.00	1,688.59	0.00	1,689.10	0.00		
1,688.09	0.00	1,688.60	0.00	1,689.11	0.00		
1,688.10	0.00	1,688.61	0.00	1,689.12	0.00		
1,688.11	0.00	1,688.62	0.00	1,689.13	0.00		
1,688.12	0.00	1,688.63	0.00	1,689.14	0.00		
1,688.13	0.00	1,688.64	0.00	1,689.15	0.00		
1,688.14	0.00	1,688.65	0.00	1,689.16	0.00		
1,688.15	0.00	1,688.66	0.00	1,689.17	0.00		
1,688.16	0.00	1,688.67	0.00	1,689.18	0.00		
1,688.17	0.00	1,688.68	0.00	1,689.19	0.00		
1,688.18	0.00	1,688.69	0.00	1,689.20	0.00		
1,688.19	0.00	1,688.70	0.00	1,689.21	0.00		
1,688.20	0.00	1,688.71	0.00	1,689.22	0.00		
1,688.21	0.00	1,688.72	0.00	1,689.23	0.00		
1,688.22	0.00	1,688.73	0.00	1,689.24	0.00		
1,688.23	0.00	1,688.74	0.00	1,689.25	0.00		
1,688.24	0.00	1,688.75	0.00	1,689.26	0.00		
1,688.25	0.00	1,688.76	0.00	1,689.27	0.00		
1,688.26	0.00	1,688.77	0.00	1,689.28	0.00		
1,688.27	0.00	1,688.78	0.00	1,689.29	0.00		
1,688.28	0.00	1,688.79	0.00	1,689.30	0.00		
1,688.29	0.00	1,688.80	0.00	1,689.31	0.00		
1,688.30	0.00	1,688.81	0.00	1,689.32	0.00		
1,688.31	0.00	1,688.82	0.00	1,689.33	0.00		
1,688.32	0.00	1,688.83	0.00	1,689.34	0.00		
1,688.33	0.00	1,688.84	0.00	1,689.35	0.00		
1,688.34	0.00	1,688.85	0.00	1,689.36	0.00		
1,688.35	0.00	1,688.86	0.00	1,689.37	0.00		
1,688.36	0.00	1,688.87	0.00	1,689.38	0.00		
1,688.37	0.00	1,688.88	0.00	1,689.39	0.00		
1,688.38	0.00	1,688.89	0.00	1,689.40	0.00		
1,688.39	0.00	1,688.90	0.00	1,689.41	0.00		
1,688.40	0.00	1,688.91	0.00	1,689.42	0.00		
1,688.41	0.00	1,688.92	0.00	1,689.43	0.00		
1,688.42	0.00	1,688.93	0.00	1,689.44	0.00		
1,688.43	0.00	1,688.94	0.00	1,689.45	0.00		
1,688.44	0.00	1,688.95	0.00	1,689.46	0.00		
1,688.45	0.00	1,688.96	0.00	1,689.47	0.00		
1,688.46	0.00	1,688.97	0.00	1,689.48	0.00		
1,688.47	0.00	1,688.98	0.00	1,689.49	0.00		
1,688.48	0.00	1,688.99	0.00	1,689.50	0.00		
1,688.49	0.00	1,689.00	0.00	1,689.51	0.55		
1,688.50	0.00	1,689.01	0.00	1,689.52	1.55		

Summary for Link 3L: Pre

Inflow Area = 6.920 ac, 3.63% Impervious, Inflow Depth = 0.22" for 2-yr event
Inflow = 1.09 cfs @ 12.07 hrs, Volume= 0.127 af
Primary = 1.09 cfs @ 12.07 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 3L: Pre



Hydrograph for Link 3L: Pre

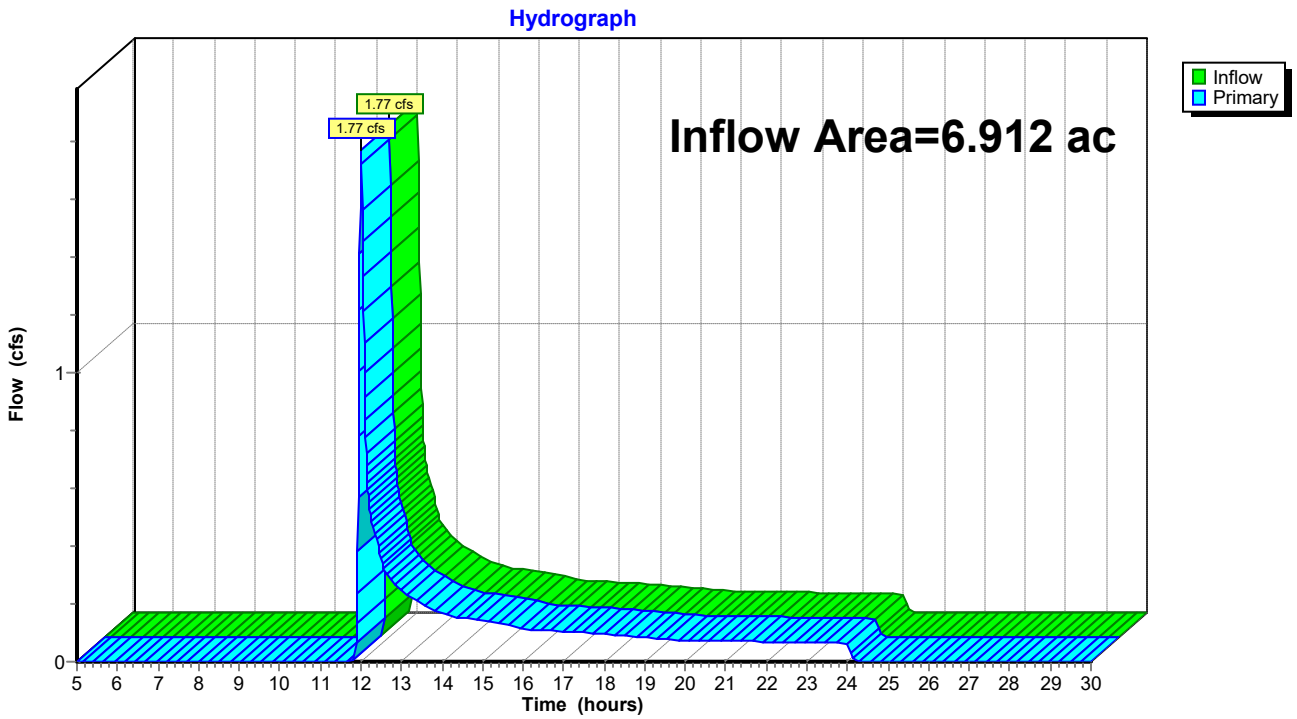
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.00	0.00	0.00
12.00	**0.61**	0.00	**0.61**
12.50	**0.35**	0.00	**0.35**
13.00	0.23	0.00	0.23
13.50	0.19	0.00	0.19
14.00	0.16	0.00	0.16
14.50	0.14	0.00	0.14
15.00	0.13	0.00	0.13
15.50	0.12	0.00	0.12
16.00	0.11	0.00	0.11
16.50	0.10	0.00	0.10
17.00	0.10	0.00	0.10
17.50	0.09	0.00	0.09
18.00	0.09	0.00	0.09
18.50	0.08	0.00	0.08
19.00	0.08	0.00	0.08
19.50	0.07	0.00	0.07
20.00	0.07	0.00	0.07
20.50	0.07	0.00	0.07
21.00	0.07	0.00	0.07
21.50	0.07	0.00	0.07
22.00	0.06	0.00	0.06
22.50	0.06	0.00	0.06
23.00	0.06	0.00	0.06
23.50	0.06	0.00	0.06
24.00	0.06	0.00	0.06
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 6L: Post

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 0.25" for 2-yr event
Inflow = 1.77 cfs @ 12.01 hrs, Volume= 0.143 af
Primary = 1.77 cfs @ 12.01 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 6L: Post



Hydrograph for Link 6L: Post

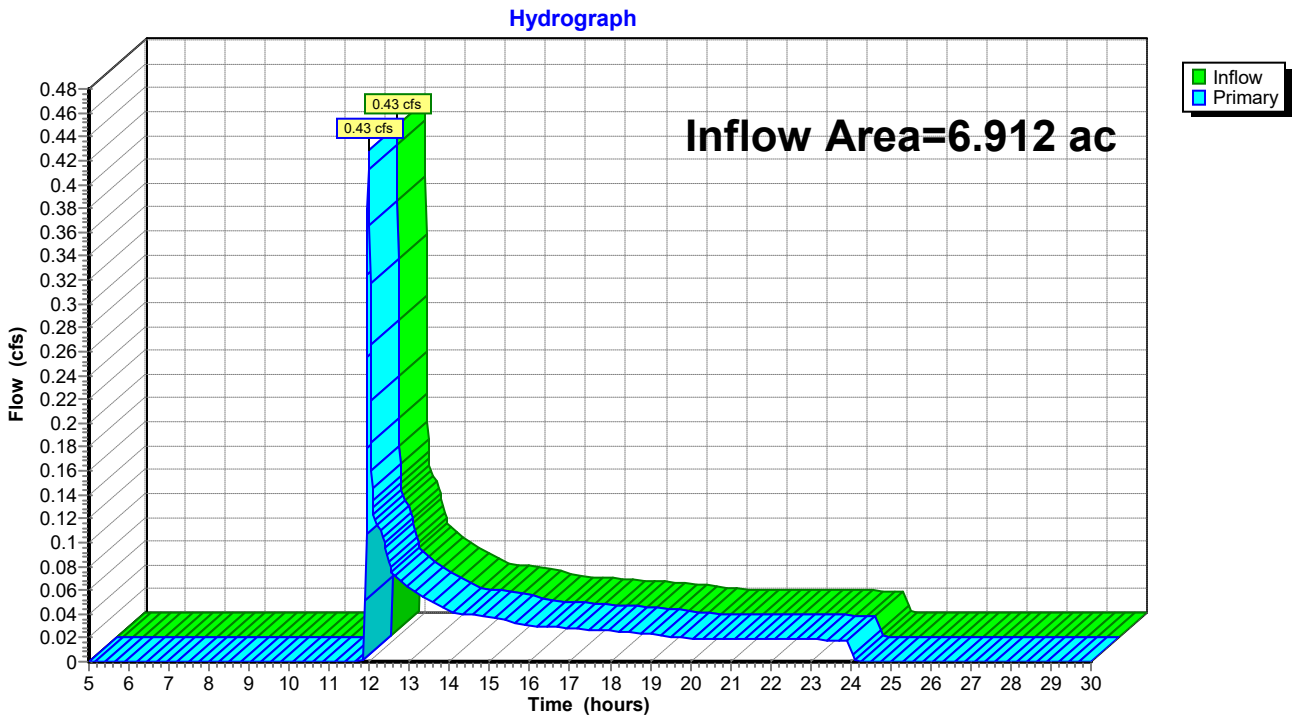
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.00	0.00	0.00
12.00	**1.75**	0.00	**1.75**
12.50	**0.36**	0.00	**0.36**
13.00	0.25	0.00	0.25
13.50	0.20	0.00	0.20
14.00	0.17	0.00	0.17
14.50	0.15	0.00	0.15
15.00	0.14	0.00	0.14
15.50	0.13	0.00	0.13
16.00	0.11	0.00	0.11
16.50	0.11	0.00	0.11
17.00	0.11	0.00	0.11
17.50	0.10	0.00	0.10
18.00	0.10	0.00	0.10
18.50	0.09	0.00	0.09
19.00	0.08	0.00	0.08
19.50	0.08	0.00	0.08
20.00	0.07	0.00	0.07
20.50	0.07	0.00	0.07
21.00	0.07	0.00	0.07
21.50	0.07	0.00	0.07
22.00	0.07	0.00	0.07
22.50	0.07	0.00	0.07
23.00	0.07	0.00	0.07
23.50	0.07	0.00	0.07
24.00	0.07	0.00	0.07
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 15L: Post w/BMP

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 0.06" for 2-yr event
Inflow = 0.43 cfs @ 11.98 hrs, Volume= 0.035 af
Primary = 0.43 cfs @ 11.98 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 15L: Post w/BMP



Hydrograph for Link 15L: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	**0.00**	0.00	**0.00**
12.00	**0.40**	0.00	**0.40**
12.50	0.08	0.00	0.08
13.00	0.06	0.00	0.06
13.50	0.05	0.00	0.05
14.00	0.04	0.00	0.04
14.50	0.04	0.00	0.04
15.00	0.04	0.00	0.04
15.50	0.03	0.00	0.03
16.00	0.03	0.00	0.03
16.50	0.03	0.00	0.03
17.00	0.03	0.00	0.03
17.50	0.03	0.00	0.03
18.00	0.03	0.00	0.03
18.50	0.02	0.00	0.02
19.00	0.02	0.00	0.02
19.50	0.02	0.00	0.02
20.00	0.02	0.00	0.02
20.50	0.02	0.00	0.02
21.00	0.02	0.00	0.02
21.50	0.02	0.00	0.02
22.00	0.02	0.00	0.02
22.50	0.02	0.00	0.02
23.00	0.02	0.00	0.02
23.50	0.02	0.00	0.02
24.00	0.02	0.00	0.02
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Time span=5.00-30.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 27S: DA-1 Runoff Area=301,436 sf 3.63% Impervious Runoff Depth=0.43"
Flow Length=860' Tc=10.4 min CN=61 Runoff=3.26 cfs 0.247 af

Subcatchment 31S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=0.39"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=1.31 cfs 0.071 af

Subcatchment 32S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=0.39"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=1.31 cfs 0.071 af

Subcatchment 33S: DA-1 Runoff Area=206,910 sf 6.09% Impervious Runoff Depth=0.50"
Flow Length=439' Tc=7.1 min CN=63 Runoff=3.41 cfs 0.199 af

Subcatchment 34S: DA-1 Runoff Area=206,911 sf 6.09% Impervious Runoff Depth=0.50"
Flow Length=439' Tc=7.1 min CN=63 Runoff=3.41 cfs 0.199 af

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,689.50' Storage=0.186 af Inflow=3.41 cfs 0.199 af
Outflow=0.08 cfs 0.013 af

Link 3L: Pre Inflow=3.26 cfs 0.247 af
Primary=3.26 cfs 0.247 af

Link 6L: Post Inflow=4.49 cfs 0.269 af
Primary=4.49 cfs 0.269 af

Link 15L: Post w/BMP Inflow=1.31 cfs 0.084 af
Primary=1.31 cfs 0.084 af

Total Runoff Area = 20.744 ac Runoff Volume = 0.785 af Average Runoff Depth = 0.45"
96.00% Pervious = 19.914 ac 4.00% Impervious = 0.830 ac

Summary for Subcatchment 27S: DA-1

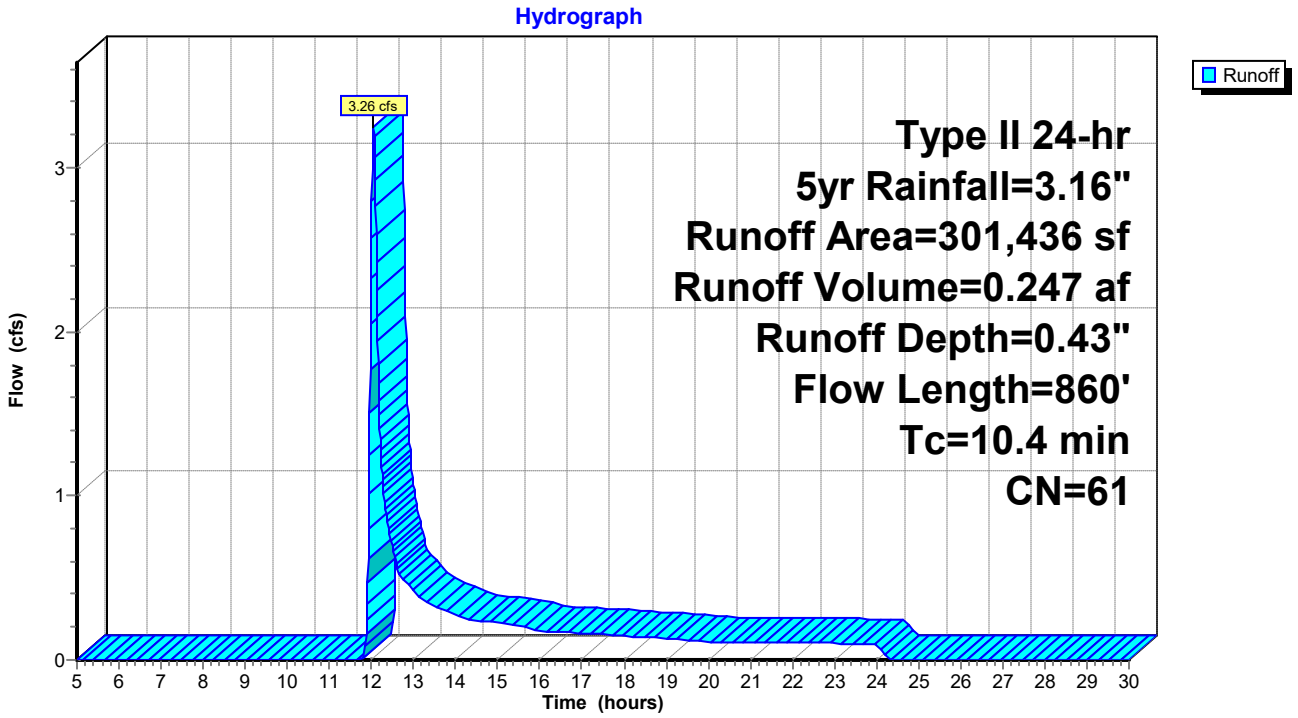
Runoff = 3.26 cfs @ 12.05 hrs, Volume= 0.247 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 5yr Rainfall=3.16"

Area (sf)	CN	Description
134,617	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
21,900	89	Paved roads w/open ditches, 50% imp, HSG B
301,436	61	Weighted Average
290,486		96.37% Pervious Area
10,950		3.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	860	Total			

Subcatchment 27S: DA-1



Hydrograph for Subcatchment 27S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.20	0.00	0.00
5.50	0.23	0.00	0.00
6.00	0.25	0.00	0.00
6.50	0.28	0.00	0.00
7.00	0.31	0.00	0.00
7.50	0.35	0.00	0.00
8.00	0.38	0.00	0.00
8.50	0.42	0.00	0.00
9.00	0.46	0.00	0.00
9.50	0.52	0.00	0.00
10.00	0.57	0.00	0.00
10.50	0.64	0.00	0.00
11.00	0.74	0.00	0.00
11.50	0.89	0.00	0.00
12.00	2.10	0.09	**2.58**
12.50	2.32	0.15	**0.68**
13.00	2.44	0.18	0.42
13.50	2.52	0.20	0.33
14.00	2.59	0.22	0.27
14.50	2.65	0.24	0.24
15.00	2.70	0.26	0.22
15.50	2.74	0.27	0.20
16.00	2.78	0.29	0.18
16.50	2.82	0.30	0.17
17.00	2.85	0.31	0.16
17.50	2.88	0.32	0.16
18.00	2.91	0.33	0.15
18.50	2.94	0.34	0.14
19.00	2.96	0.35	0.13
19.50	2.99	0.36	0.12
20.00	3.01	0.37	0.11
20.50	3.03	0.38	0.11
21.00	3.05	0.38	0.11
21.50	3.07	0.39	0.11
22.00	3.09	0.40	0.10
22.50	3.11	0.41	0.10
23.00	3.12	0.41	0.10
23.50	3.14	0.42	0.10
24.00	**3.16**	**0.43**	0.10
24.50	3.16	0.43	0.00
25.00	3.16	0.43	0.00
25.50	3.16	0.43	0.00
26.00	3.16	0.43	0.00
26.50	3.16	0.43	0.00
27.00	3.16	0.43	0.00
27.50	3.16	0.43	0.00
28.00	3.16	0.43	0.00
28.50	3.16	0.43	0.00
29.00	3.16	0.43	0.00
29.50	3.16	0.43	0.00
30.00	3.16	0.43	0.00

Summary for Subcatchment 31S: DA-2

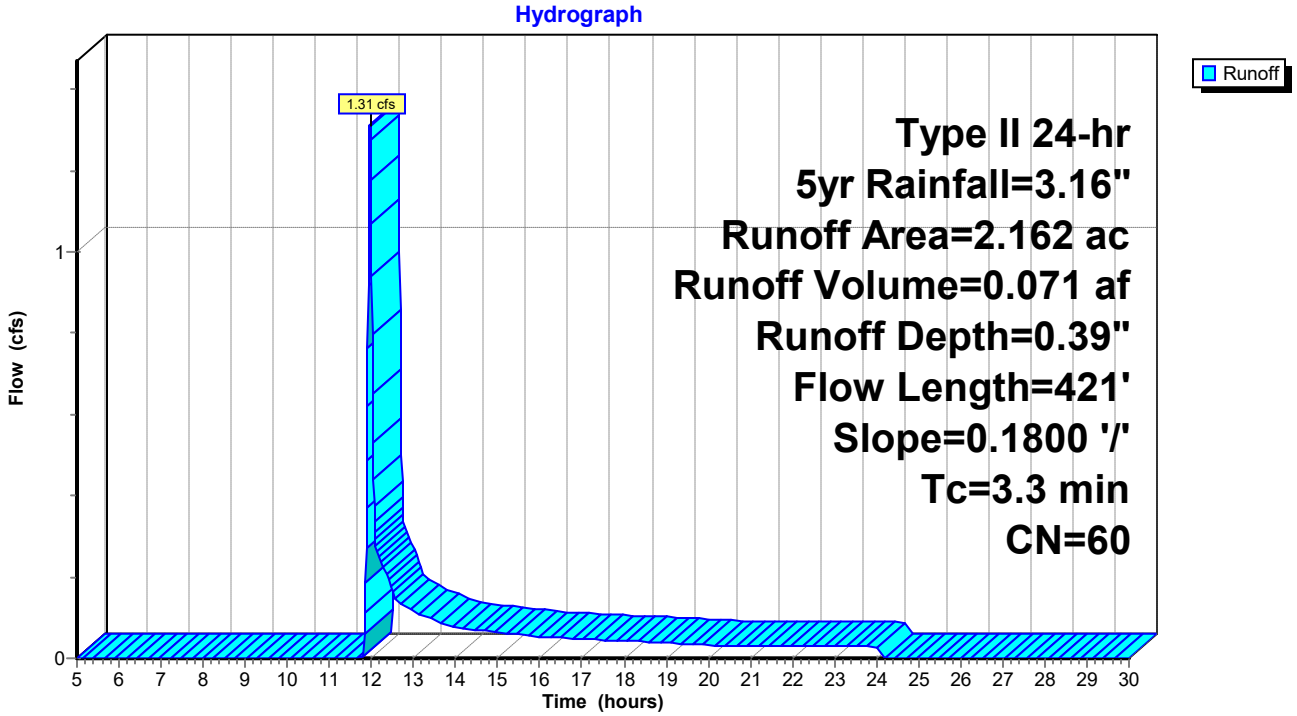
Runoff = 1.31 cfs @ 11.96 hrs, Volume= 0.071 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 5yr Rainfall=3.16"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 31S: DA-2



Hydrograph for Subcatchment 31S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.20	0.00	0.00
5.50	0.23	0.00	0.00
6.00	0.25	0.00	0.00
6.50	0.28	0.00	0.00
7.00	0.31	0.00	0.00
7.50	0.35	0.00	0.00
8.00	0.38	0.00	0.00
8.50	0.42	0.00	0.00
9.00	0.46	0.00	0.00
9.50	0.52	0.00	0.00
10.00	0.57	0.00	0.00
10.50	0.64	0.00	0.00
11.00	0.74	0.00	0.00
11.50	0.89	0.00	**0.00**
12.00	2.10	0.08	**1.07**
12.50	2.32	0.13	0.16
13.00	2.44	0.16	0.12
13.50	2.52	0.18	0.09
14.00	2.59	0.20	0.08
14.50	2.65	0.22	0.07
15.00	2.70	0.23	0.06
15.50	2.74	0.25	0.06
16.00	2.78	0.26	0.05
16.50	2.82	0.27	0.05
17.00	2.85	0.28	0.05
17.50	2.88	0.29	0.05
18.00	2.91	0.30	0.04
18.50	2.94	0.31	0.04
19.00	2.96	0.32	0.04
19.50	2.99	0.33	0.04
20.00	3.01	0.34	0.03
20.50	3.03	0.34	0.03
21.00	3.05	0.35	0.03
21.50	3.07	0.36	0.03
22.00	3.09	0.37	0.03
22.50	3.11	0.37	0.03
23.00	3.12	0.38	0.03
23.50	3.14	0.39	0.03
24.00	**3.16**	**0.39**	0.03
24.50	3.16	0.39	0.00
25.00	3.16	0.39	0.00
25.50	3.16	0.39	0.00
26.00	3.16	0.39	0.00
26.50	3.16	0.39	0.00
27.00	3.16	0.39	0.00
27.50	3.16	0.39	0.00
28.00	3.16	0.39	0.00
28.50	3.16	0.39	0.00
29.00	3.16	0.39	0.00
29.50	3.16	0.39	0.00
30.00	3.16	0.39	0.00

Summary for Subcatchment 32S: DA-2

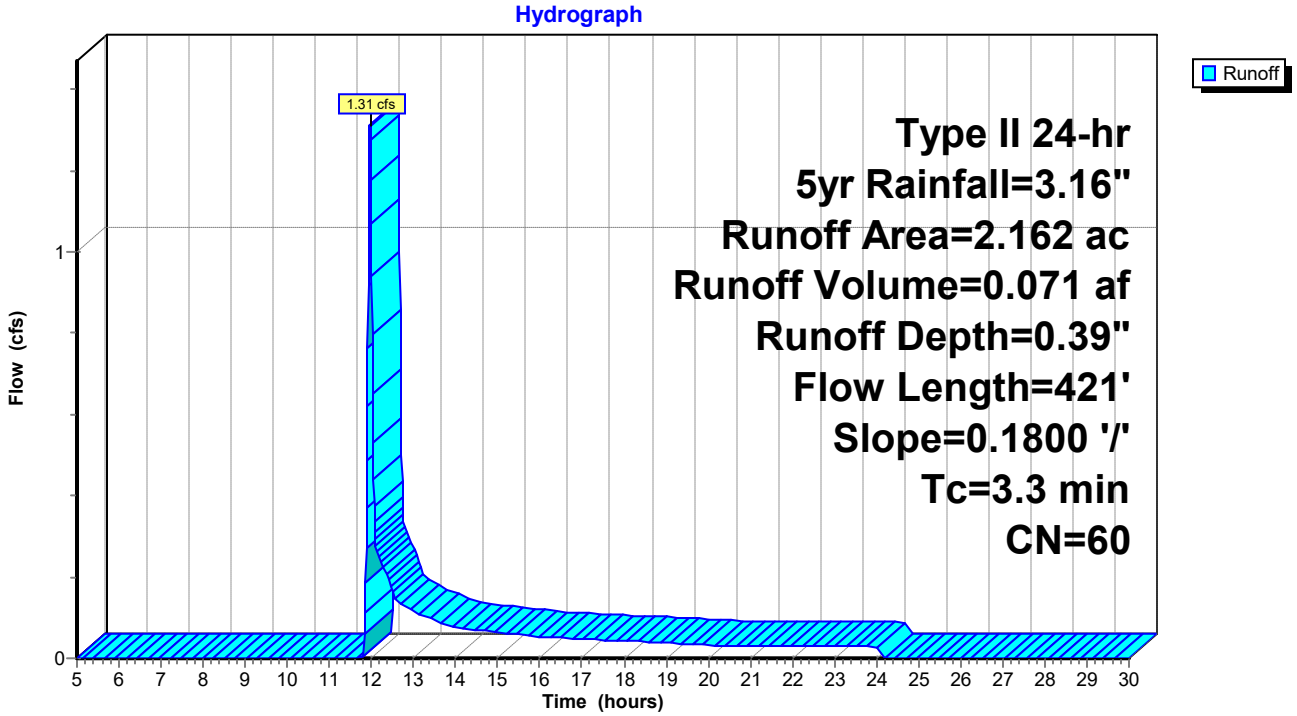
Runoff = 1.31 cfs @ 11.96 hrs, Volume= 0.071 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 5yr Rainfall=3.16"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 32S: DA-2



Hydrograph for Subcatchment 32S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.20	0.00	0.00
5.50	0.23	0.00	0.00
6.00	0.25	0.00	0.00
6.50	0.28	0.00	0.00
7.00	0.31	0.00	0.00
7.50	0.35	0.00	0.00
8.00	0.38	0.00	0.00
8.50	0.42	0.00	0.00
9.00	0.46	0.00	0.00
9.50	0.52	0.00	0.00
10.00	0.57	0.00	0.00
10.50	0.64	0.00	0.00
11.00	0.74	0.00	0.00
11.50	0.89	0.00	**0.00**
12.00	2.10	0.08	**1.07**
12.50	2.32	0.13	0.16
13.00	2.44	0.16	0.12
13.50	2.52	0.18	0.09
14.00	2.59	0.20	0.08
14.50	2.65	0.22	0.07
15.00	2.70	0.23	0.06
15.50	2.74	0.25	0.06
16.00	2.78	0.26	0.05
16.50	2.82	0.27	0.05
17.00	2.85	0.28	0.05
17.50	2.88	0.29	0.05
18.00	2.91	0.30	0.04
18.50	2.94	0.31	0.04
19.00	2.96	0.32	0.04
19.50	2.99	0.33	0.04
20.00	3.01	0.34	0.03
20.50	3.03	0.34	0.03
21.00	3.05	0.35	0.03
21.50	3.07	0.36	0.03
22.00	3.09	0.37	0.03
22.50	3.11	0.37	0.03
23.00	3.12	0.38	0.03
23.50	3.14	0.39	0.03
24.00	**3.16**	**0.39**	0.03
24.50	3.16	0.39	0.00
25.00	3.16	0.39	0.00
25.50	3.16	0.39	0.00
26.00	3.16	0.39	0.00
26.50	3.16	0.39	0.00
27.00	3.16	0.39	0.00
27.50	3.16	0.39	0.00
28.00	3.16	0.39	0.00
28.50	3.16	0.39	0.00
29.00	3.16	0.39	0.00
29.50	3.16	0.39	0.00
30.00	3.16	0.39	0.00

Summary for Subcatchment 33S: DA-1

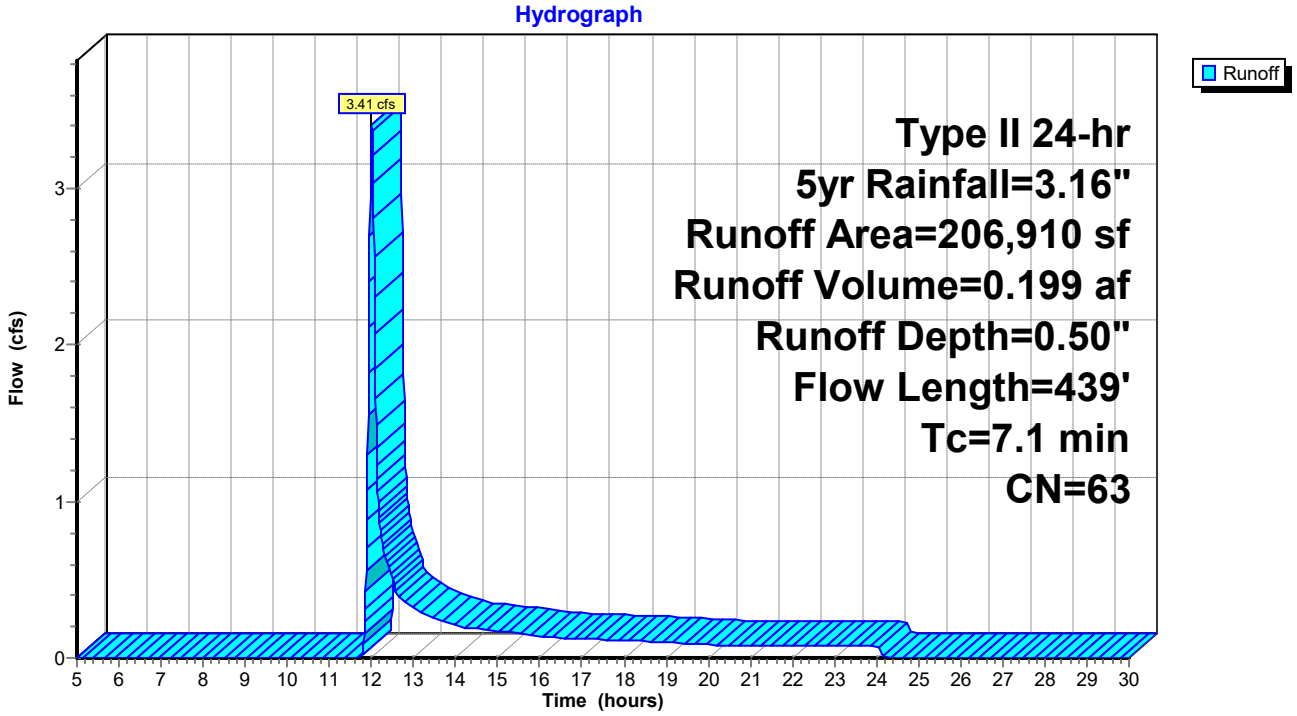
Runoff = 3.41 cfs @ 12.01 hrs, Volume= 0.199 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 5yr Rainfall=3.16"

Area (sf)	CN	Description
36,765	58	Meadow, non-grazed, HSG B
144,924	60	Woods, Fair, HSG B
25,221	89	Paved roads w/open ditches, 50% imp, HSG B
206,910	63	Weighted Average
194,300		93.91% Pervious Area
12,611		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 33S: DA-1



Hydrograph for Subcatchment 33S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.20	0.00	0.00
5.50	0.23	0.00	0.00
6.00	0.25	0.00	0.00
6.50	0.28	0.00	0.00
7.00	0.31	0.00	0.00
7.50	0.35	0.00	0.00
8.00	0.38	0.00	0.00
8.50	0.42	0.00	0.00
9.00	0.46	0.00	0.00
9.50	0.52	0.00	0.00
10.00	0.57	0.00	0.00
10.50	0.64	0.00	0.00
11.00	0.74	0.00	0.00
11.50	0.89	0.00	0.00
12.00	2.10	0.12	**3.39**
12.50	2.32	0.19	**0.50**
13.00	2.44	0.22	0.32
13.50	2.52	0.25	0.25
14.00	2.59	0.28	0.21
14.50	2.65	0.30	0.19
15.00	2.70	0.31	0.17
15.50	2.74	0.33	0.15
16.00	2.78	0.34	0.14
16.50	2.82	0.36	0.13
17.00	2.85	0.37	0.12
17.50	2.88	0.38	0.12
18.00	2.91	0.40	0.11
18.50	2.94	0.41	0.11
19.00	2.96	0.42	0.10
19.50	2.99	0.43	0.09
20.00	3.01	0.44	0.08
20.50	3.03	0.44	0.08
21.00	3.05	0.45	0.08
21.50	3.07	0.46	0.08
22.00	3.09	0.47	0.08
22.50	3.11	0.48	0.08
23.00	3.12	0.49	0.08
23.50	3.14	0.49	0.08
24.00	**3.16**	**0.50**	0.07
24.50	3.16	0.50	0.00
25.00	3.16	0.50	0.00
25.50	3.16	0.50	0.00
26.00	3.16	0.50	0.00
26.50	3.16	0.50	0.00
27.00	3.16	0.50	0.00
27.50	3.16	0.50	0.00
28.00	3.16	0.50	0.00
28.50	3.16	0.50	0.00
29.00	3.16	0.50	0.00
29.50	3.16	0.50	0.00
30.00	3.16	0.50	0.00

Summary for Subcatchment 34S: DA-1

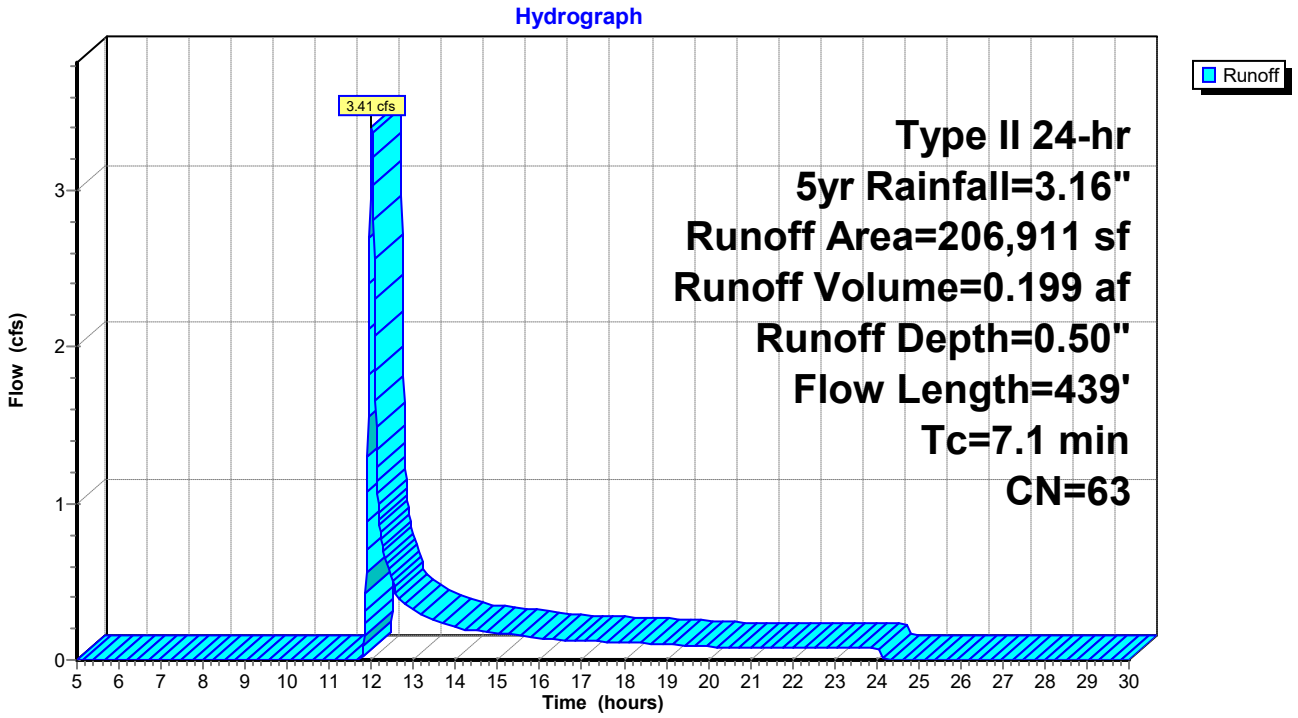
Runoff = 3.41 cfs @ 12.01 hrs, Volume= 0.199 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 5yr Rainfall=3.16"

Area (sf)	CN	Description
36,785	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
25,207	89	Paved roads w/open ditches, 50% imp, HSG B
206,911	63	Weighted Average
194,308		93.91% Pervious Area
12,604		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 34S: DA-1



Hydrograph for Subcatchment 34S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.20	0.00	0.00
5.50	0.23	0.00	0.00
6.00	0.25	0.00	0.00
6.50	0.28	0.00	0.00
7.00	0.31	0.00	0.00
7.50	0.35	0.00	0.00
8.00	0.38	0.00	0.00
8.50	0.42	0.00	0.00
9.00	0.46	0.00	0.00
9.50	0.52	0.00	0.00
10.00	0.57	0.00	0.00
10.50	0.64	0.00	0.00
11.00	0.74	0.00	0.00
11.50	0.89	0.00	0.00
12.00	2.10	0.12	**3.39**
12.50	2.32	0.19	**0.50**
13.00	2.44	0.22	0.32
13.50	2.52	0.25	0.25
14.00	2.59	0.28	0.21
14.50	2.65	0.30	0.19
15.00	2.70	0.31	0.17
15.50	2.74	0.33	0.15
16.00	2.78	0.34	0.14
16.50	2.82	0.36	0.13
17.00	2.85	0.37	0.12
17.50	2.88	0.38	0.12
18.00	2.91	0.40	0.11
18.50	2.94	0.41	0.11
19.00	2.96	0.42	0.10
19.50	2.99	0.43	0.09
20.00	3.01	0.44	0.08
20.50	3.03	0.44	0.08
21.00	3.05	0.45	0.08
21.50	3.07	0.46	0.08
22.00	3.09	0.47	0.08
22.50	3.11	0.48	0.08
23.00	3.12	0.49	0.08
23.50	3.14	0.49	0.08
24.00	**3.16**	**0.50**	0.07
24.50	3.16	0.50	0.00
25.00	3.16	0.50	0.00
25.50	3.16	0.50	0.00
26.00	3.16	0.50	0.00
26.50	3.16	0.50	0.00
27.00	3.16	0.50	0.00
27.50	3.16	0.50	0.00
28.00	3.16	0.50	0.00
28.50	3.16	0.50	0.00
29.00	3.16	0.50	0.00
29.50	3.16	0.50	0.00
30.00	3.16	0.50	0.00

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area =	4.750 ac,	6.09% Impervious,	Inflow Depth =	0.50"	for 5yr event
Inflow =	3.41 cfs @	12.01 hrs,	Volume=	0.199 af	
Outflow =	0.08 cfs @	22.35 hrs,	Volume=	0.013 af,	Atten= 98%, Lag= 620.4 min
Primary =	0.08 cfs @	22.35 hrs,	Volume=	0.013 af	

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,689.50' @ 22.35 hrs Surf.Area= 0.142 ac Storage= 0.186 af

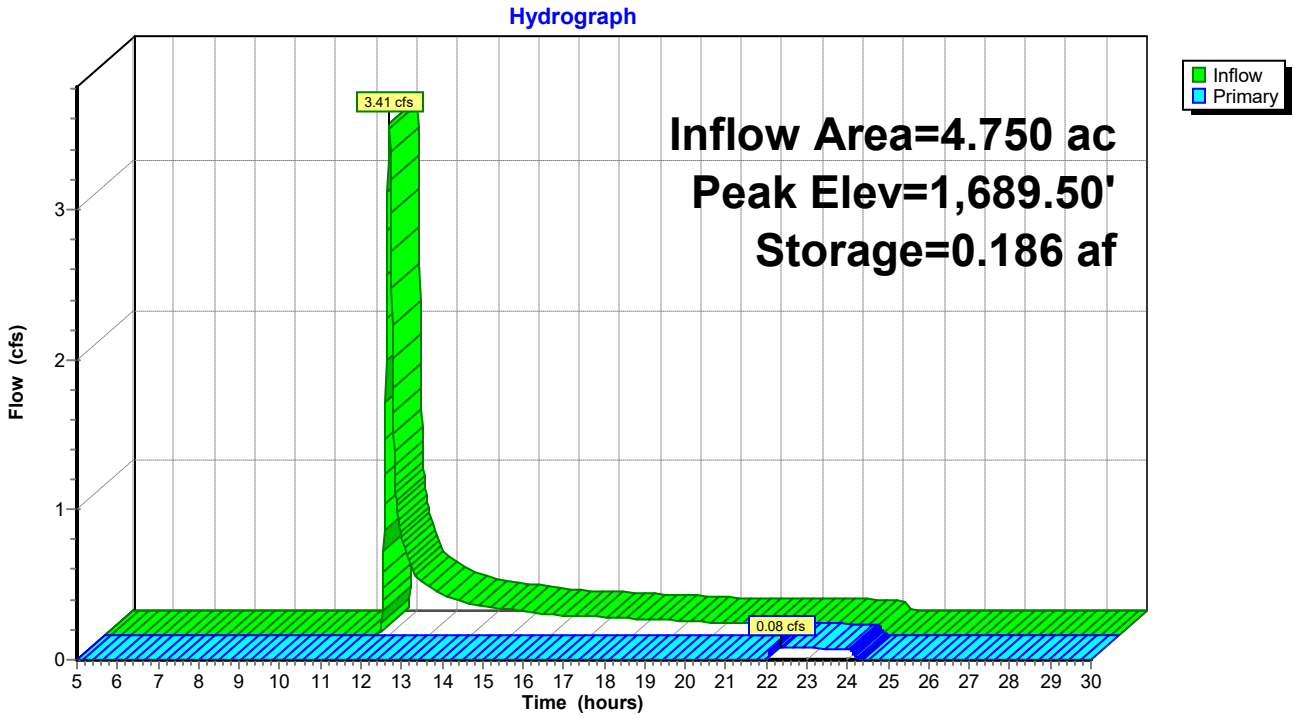
Plug-Flow detention time= 671.0 min calculated for 0.013 af (7% of inflow)
Center-of-Mass det. time= 481.2 min (1,386.3 - 905.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,688.00'	0.200 af	**20.00'W x 231.00'L x 1.60'H Prismatoid Z=2.0**

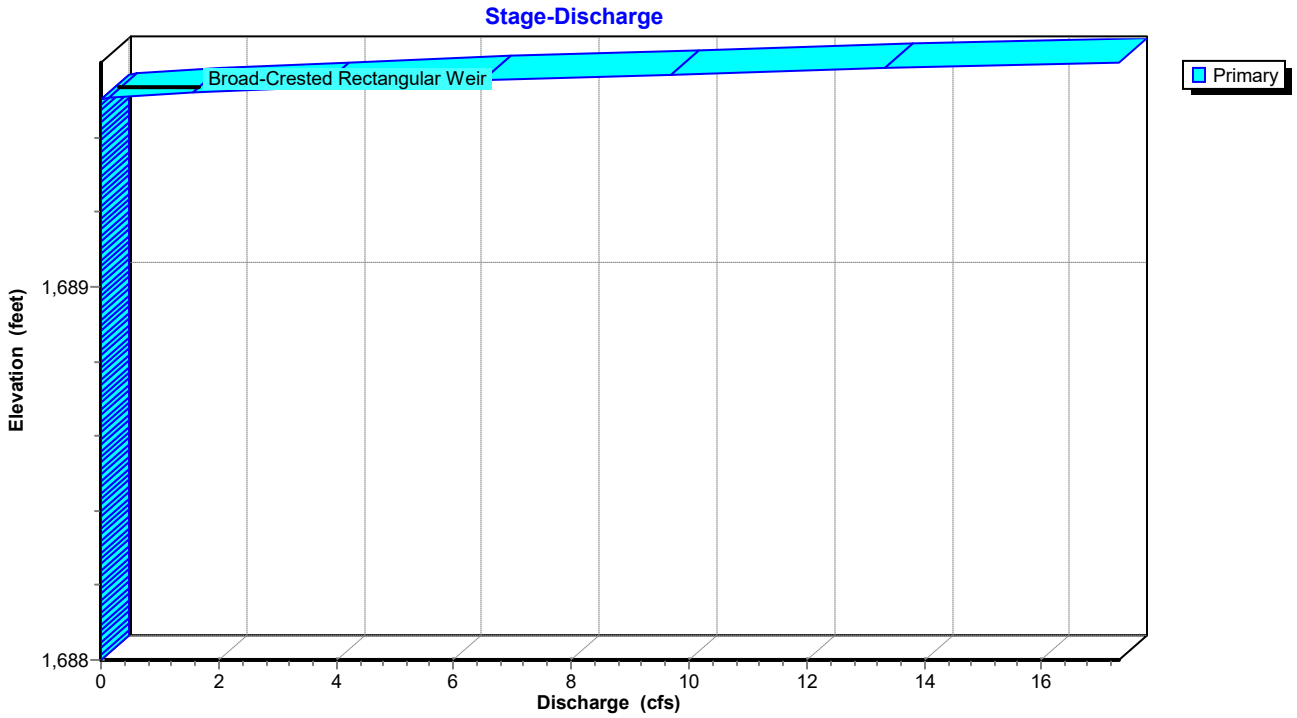
Device	Routing	Invert	Outlet Devices
#1	Primary	1,689.50'	**231.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.06 cfs @ 22.35 hrs HW=1,689.50' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.06 cfs @ 0.11 fps)

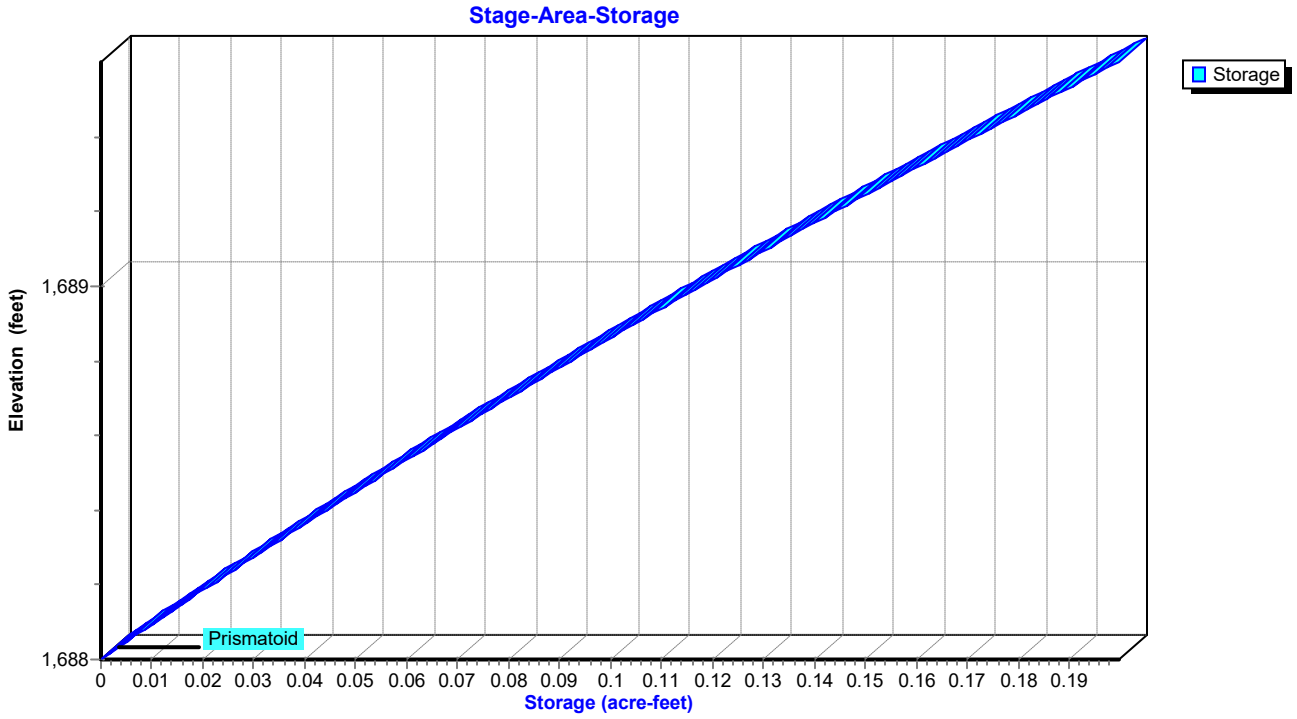
Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0.000	1,688.00	0.00
5.50	0.00	0.000	1,688.00	0.00
6.00	0.00	0.000	1,688.00	0.00
6.50	0.00	0.000	1,688.00	0.00
7.00	0.00	0.000	1,688.00	0.00
7.50	0.00	0.000	1,688.00	0.00
8.00	0.00	0.000	1,688.00	0.00
8.50	0.00	0.000	1,688.00	0.00
9.00	0.00	0.000	1,688.00	0.00
9.50	0.00	0.000	1,688.00	0.00
10.00	0.00	0.000	1,688.00	0.00
10.50	0.00	0.000	1,688.00	0.00
11.00	0.00	0.000	1,688.00	0.00
11.50	0.00	0.000	1,688.00	0.00
12.00	**3.39**	0.023	1,688.21	0.00
12.50	**0.50**	0.070	1,688.62	0.00
13.00	0.32	0.086	1,688.75	0.00
13.50	0.25	0.098	1,688.84	0.00
14.00	0.21	0.107	1,688.92	0.00
14.50	0.19	0.115	1,688.98	0.00
15.00	0.17	0.123	1,689.04	0.00
15.50	0.15	0.129	1,689.09	0.00
16.00	0.14	0.135	1,689.13	0.00
16.50	0.13	0.141	1,689.18	0.00
17.00	0.12	0.146	1,689.21	0.00
17.50	0.12	0.151	1,689.25	0.00
18.00	0.11	0.156	1,689.29	0.00
18.50	0.11	0.160	1,689.32	0.00
19.00	0.10	0.164	1,689.35	0.00
19.50	0.09	0.168	1,689.38	0.00
20.00	0.08	0.172	1,689.40	0.00
20.50	0.08	0.175	1,689.43	0.00
21.00	0.08	0.179	1,689.45	0.00
21.50	0.08	0.182	1,689.48	0.00
22.00	0.08	**0.185**	**1,689.50**	**0.00**
22.50	0.08	**0.186**	**1,689.50**	**0.08**
23.00	0.08	0.186	1,689.50	0.08
23.50	0.08	0.186	1,689.50	0.08
24.00	0.07	0.186	1,689.50	0.07
24.50	0.00	0.185	1,689.50	0.00
25.00	0.00	0.185	1,689.50	0.00
25.50	0.00	0.185	1,689.50	0.00
26.00	0.00	0.185	1,689.50	0.00
26.50	0.00	0.185	1,689.50	0.00
27.00	0.00	0.185	1,689.50	0.00
27.50	0.00	0.185	1,689.50	0.00
28.00	0.00	0.185	1,689.50	0.00
28.50	0.00	0.185	1,689.50	0.00
29.00	0.00	0.185	1,689.50	0.00
29.50	0.00	0.185	1,689.50	0.00
30.00	0.00	0.185	1,689.50	0.00

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

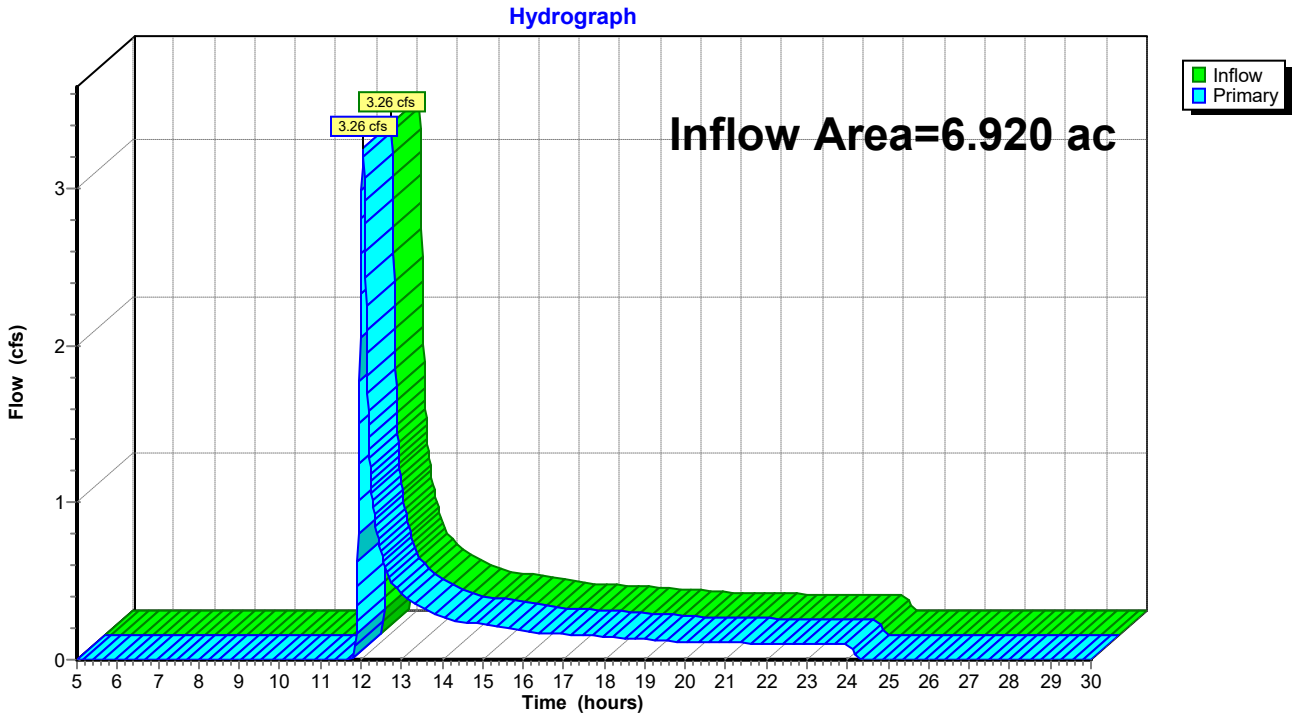
Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,688.00	0.00	1,688.51	0.00	1,689.02	0.00	1,689.53	2.84
1,688.01	0.00	1,688.52	0.00	1,689.03	0.00	1,689.54	4.38
1,688.02	0.00	1,688.53	0.00	1,689.04	0.00	1,689.55	6.12
1,688.03	0.00	1,688.54	0.00	1,689.05	0.00	1,689.56	8.05
1,688.04	0.00	1,688.55	0.00	1,689.06	0.00	1,689.57	10.14
1,688.05	0.00	1,688.56	0.00	1,689.07	0.00	1,689.58	12.39
1,688.06	0.00	1,688.57	0.00	1,689.08	0.00	1,689.59	14.78
1,688.07	0.00	1,688.58	0.00	1,689.09	0.00	1,689.60	**17.31**
1,688.08	0.00	1,688.59	0.00	1,689.10	0.00		
1,688.09	0.00	1,688.60	0.00	1,689.11	0.00		
1,688.10	0.00	1,688.61	0.00	1,689.12	0.00		
1,688.11	0.00	1,688.62	0.00	1,689.13	0.00		
1,688.12	0.00	1,688.63	0.00	1,689.14	0.00		
1,688.13	0.00	1,688.64	0.00	1,689.15	0.00		
1,688.14	0.00	1,688.65	0.00	1,689.16	0.00		
1,688.15	0.00	1,688.66	0.00	1,689.17	0.00		
1,688.16	0.00	1,688.67	0.00	1,689.18	0.00		
1,688.17	0.00	1,688.68	0.00	1,689.19	0.00		
1,688.18	0.00	1,688.69	0.00	1,689.20	0.00		
1,688.19	0.00	1,688.70	0.00	1,689.21	0.00		
1,688.20	0.00	1,688.71	0.00	1,689.22	0.00		
1,688.21	0.00	1,688.72	0.00	1,689.23	0.00		
1,688.22	0.00	1,688.73	0.00	1,689.24	0.00		
1,688.23	0.00	1,688.74	0.00	1,689.25	0.00		
1,688.24	0.00	1,688.75	0.00	1,689.26	0.00		
1,688.25	0.00	1,688.76	0.00	1,689.27	0.00		
1,688.26	0.00	1,688.77	0.00	1,689.28	0.00		
1,688.27	0.00	1,688.78	0.00	1,689.29	0.00		
1,688.28	0.00	1,688.79	0.00	1,689.30	0.00		
1,688.29	0.00	1,688.80	0.00	1,689.31	0.00		
1,688.30	0.00	1,688.81	0.00	1,689.32	0.00		
1,688.31	0.00	1,688.82	0.00	1,689.33	0.00		
1,688.32	0.00	1,688.83	0.00	1,689.34	0.00		
1,688.33	0.00	1,688.84	0.00	1,689.35	0.00		
1,688.34	0.00	1,688.85	0.00	1,689.36	0.00		
1,688.35	0.00	1,688.86	0.00	1,689.37	0.00		
1,688.36	0.00	1,688.87	0.00	1,689.38	0.00		
1,688.37	0.00	1,688.88	0.00	1,689.39	0.00		
1,688.38	0.00	1,688.89	0.00	1,689.40	0.00		
1,688.39	0.00	1,688.90	0.00	1,689.41	0.00		
1,688.40	0.00	1,688.91	0.00	1,689.42	0.00		
1,688.41	0.00	1,688.92	0.00	1,689.43	0.00		
1,688.42	0.00	1,688.93	0.00	1,689.44	0.00		
1,688.43	0.00	1,688.94	0.00	1,689.45	0.00		
1,688.44	0.00	1,688.95	0.00	1,689.46	0.00		
1,688.45	0.00	1,688.96	0.00	1,689.47	0.00		
1,688.46	0.00	1,688.97	0.00	1,689.48	0.00		
1,688.47	0.00	1,688.98	0.00	1,689.49	0.00		
1,688.48	0.00	1,688.99	0.00	1,689.50	0.00		
1,688.49	0.00	1,689.00	0.00	1,689.51	0.55		
1,688.50	0.00	1,689.01	0.00	1,689.52	1.55		

Summary for Link 3L: Pre

Inflow Area = 6.920 ac, 3.63% Impervious, Inflow Depth = 0.43" for 5yr event
Inflow = 3.26 cfs @ 12.05 hrs, Volume= 0.247 af
Primary = 3.26 cfs @ 12.05 hrs, Volume= 0.247 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 3L: Pre



Hydrograph for Link 3L: Pre

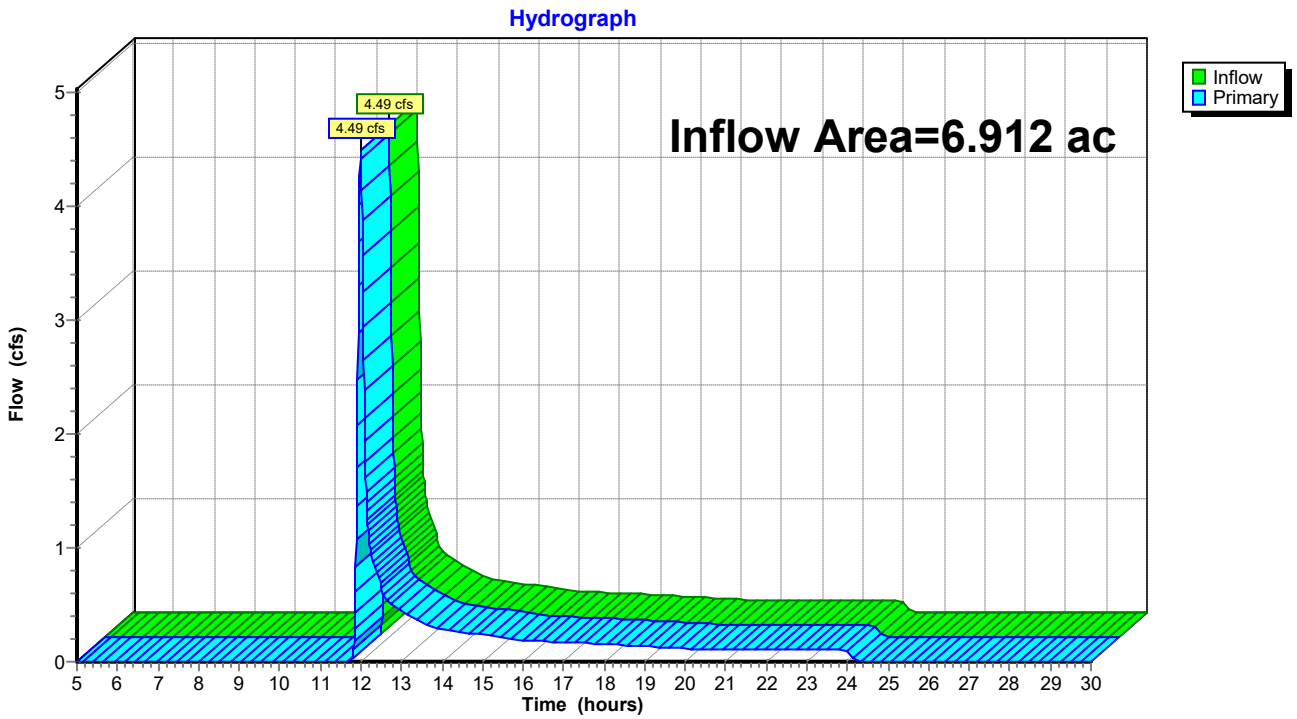
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.00	0.00	0.00
12.00	**2.58**	0.00	**2.58**
12.50	**0.68**	0.00	**0.68**
13.00	0.42	0.00	0.42
13.50	0.33	0.00	0.33
14.00	0.27	0.00	0.27
14.50	0.24	0.00	0.24
15.00	0.22	0.00	0.22
15.50	0.20	0.00	0.20
16.00	0.18	0.00	0.18
16.50	0.17	0.00	0.17
17.00	0.16	0.00	0.16
17.50	0.16	0.00	0.16
18.00	0.15	0.00	0.15
18.50	0.14	0.00	0.14
19.00	0.13	0.00	0.13
19.50	0.12	0.00	0.12
20.00	0.11	0.00	0.11
20.50	0.11	0.00	0.11
21.00	0.11	0.00	0.11
21.50	0.11	0.00	0.11
22.00	0.10	0.00	0.10
22.50	0.10	0.00	0.10
23.00	0.10	0.00	0.10
23.50	0.10	0.00	0.10
24.00	0.10	0.00	0.10
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 6L: Post

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 0.47" for 5yr event
Inflow = 4.49 cfs @ 11.99 hrs, Volume= 0.269 af
Primary = 4.49 cfs @ 11.99 hrs, Volume= 0.269 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 6L: Post



Hydrograph for Link 6L: Post

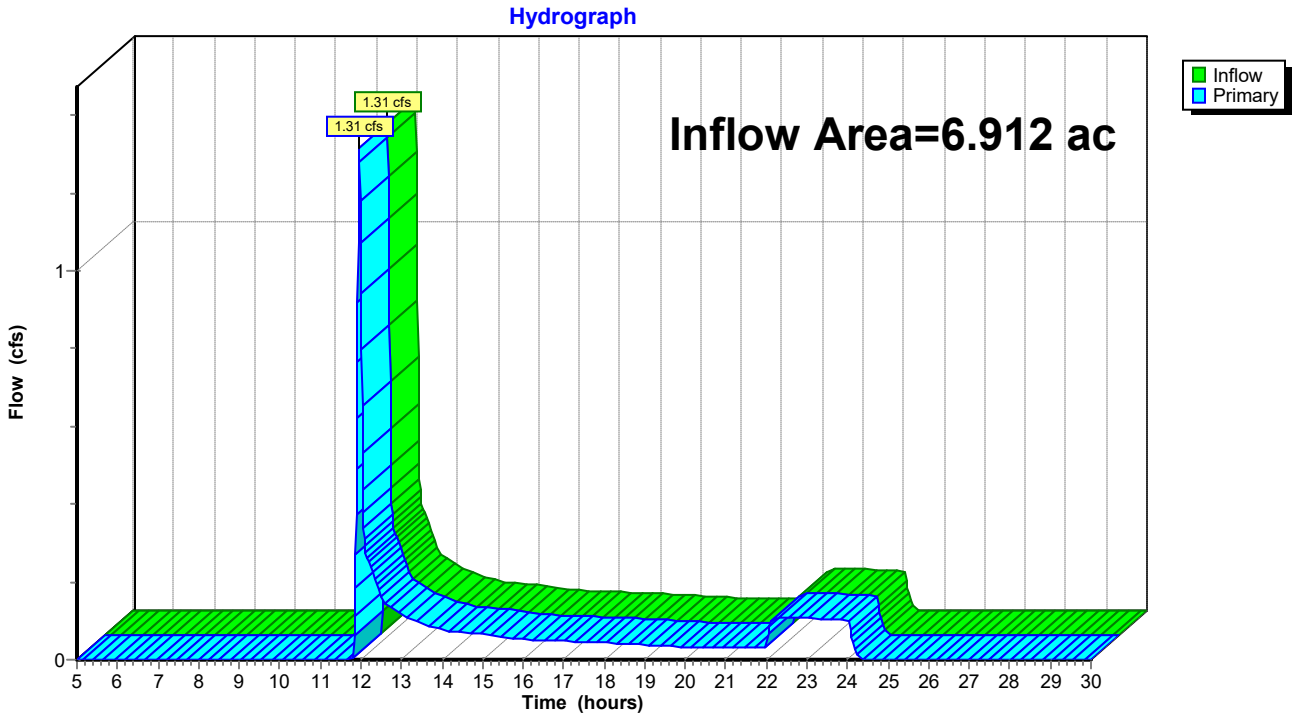
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	**0.00**	0.00	**0.00**
12.00	**4.46**	0.00	**4.46**
12.50	0.66	0.00	0.66
13.00	0.44	0.00	0.44
13.50	0.35	0.00	0.35
14.00	0.28	0.00	0.28
14.50	0.26	0.00	0.26
15.00	0.24	0.00	0.24
15.50	0.21	0.00	0.21
16.00	0.19	0.00	0.19
16.50	0.18	0.00	0.18
17.00	0.17	0.00	0.17
17.50	0.16	0.00	0.16
18.00	0.15	0.00	0.15
18.50	0.15	0.00	0.15
19.00	0.14	0.00	0.14
19.50	0.13	0.00	0.13
20.00	0.12	0.00	0.12
20.50	0.11	0.00	0.11
21.00	0.11	0.00	0.11
21.50	0.11	0.00	0.11
22.00	0.11	0.00	0.11
22.50	0.11	0.00	0.11
23.00	0.11	0.00	0.11
23.50	0.10	0.00	0.10
24.00	0.10	0.00	0.10
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 15L: Post w/BMP

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 0.15" for 5yr event
Inflow = 1.31 cfs @ 11.96 hrs, Volume= 0.084 af
Primary = 1.31 cfs @ 11.96 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 15L: Post w/BMP



Hydrograph for Link 15L: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	**0.00**	0.00	**0.00**
12.00	**1.07**	0.00	**1.07**
12.50	0.16	0.00	0.16
13.00	0.12	0.00	0.12
13.50	0.09	0.00	0.09
14.00	0.08	0.00	0.08
14.50	0.07	0.00	0.07
15.00	0.06	0.00	0.06
15.50	0.06	0.00	0.06
16.00	0.05	0.00	0.05
16.50	0.05	0.00	0.05
17.00	0.05	0.00	0.05
17.50	0.05	0.00	0.05
18.00	0.04	0.00	0.04
18.50	0.04	0.00	0.04
19.00	0.04	0.00	0.04
19.50	0.04	0.00	0.04
20.00	0.03	0.00	0.03
20.50	0.03	0.00	0.03
21.00	0.03	0.00	0.03
21.50	0.03	0.00	0.03
22.00	0.03	0.00	0.03
22.50	0.11	0.00	0.11
23.00	0.11	0.00	0.11
23.50	0.10	0.00	0.10
24.00	0.10	0.00	0.10
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Time span=5.00-30.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 27S: DA-1 Runoff Area=301,436 sf 3.63% Impervious Runoff Depth=0.65"
Flow Length=860' Tc=10.4 min CN=61 Runoff=5.67 cfs 0.373 af

Subcatchment 31S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=0.60"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=2.28 cfs 0.108 af

Subcatchment 32S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=0.60"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=2.28 cfs 0.108 af

Subcatchment 33S: DA-1 Runoff Area=206,910 sf 6.09% Impervious Runoff Depth=0.74"
Flow Length=439' Tc=7.1 min CN=63 Runoff=5.47 cfs 0.293 af

Subcatchment 34S: DA-1 Runoff Area=206,911 sf 6.09% Impervious Runoff Depth=0.74"
Flow Length=439' Tc=7.1 min CN=63 Runoff=5.47 cfs 0.293 af

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,689.51' Storage=0.186 af Inflow=5.47 cfs 0.293 af
Outflow=0.24 cfs 0.107 af

Link 3L: Pre Inflow=5.67 cfs 0.373 af
Primary=5.67 cfs 0.373 af

Link 6L: Post Inflow=7.36 cfs 0.401 af
Primary=7.36 cfs 0.401 af

Link 15L: Post w/BMP Inflow=2.28 cfs 0.216 af
Primary=2.28 cfs 0.216 af

Total Runoff Area = 20.744 ac Runoff Volume = 1.175 af Average Runoff Depth = 0.68"
96.00% Pervious = 19.914 ac 4.00% Impervious = 0.830 ac

Summary for Subcatchment 27S: DA-1

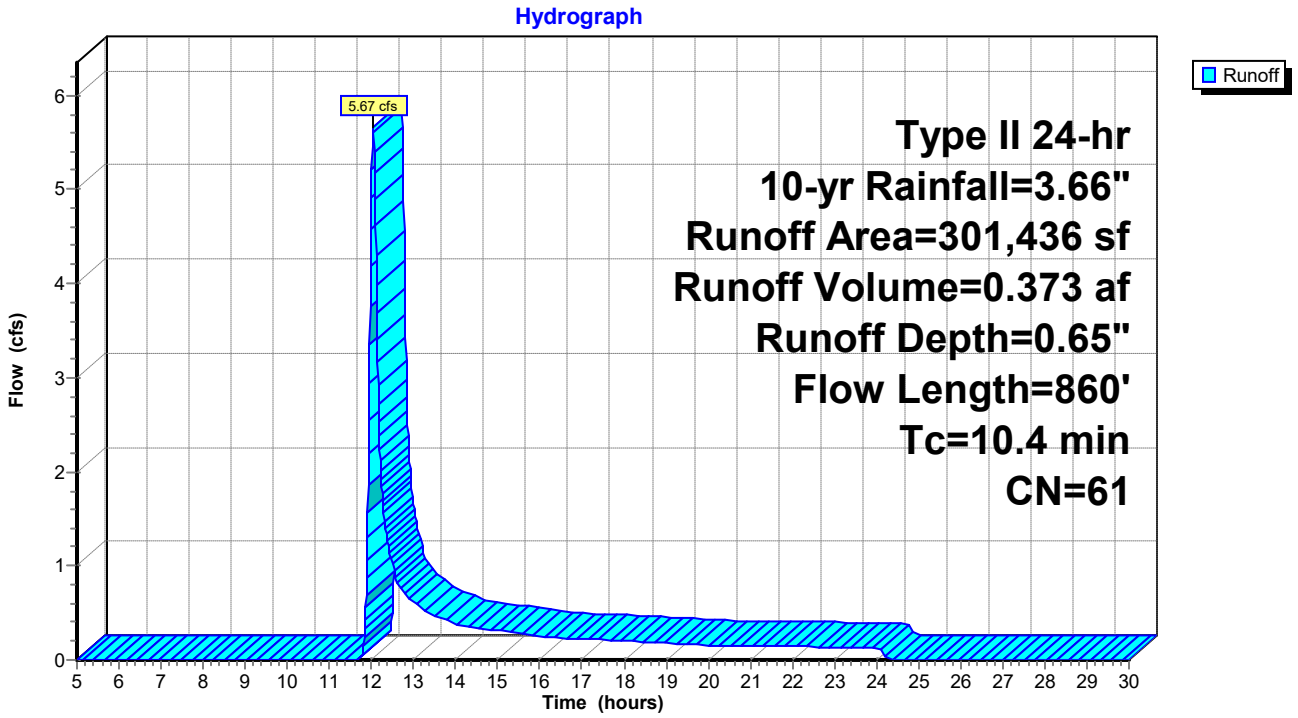
Runoff = 5.67 cfs @ 12.04 hrs, Volume= 0.373 af, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (sf)	CN	Description
134,617	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
21,900	89	Paved roads w/open ditches, 50% imp, HSG B
301,436	61	Weighted Average
290,486		96.37% Pervious Area
10,950		3.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	860	Total			

Subcatchment 27S: DA-1



Hydrograph for Subcatchment 27S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.23	0.00	0.00
5.50	0.26	0.00	0.00
6.00	0.29	0.00	0.00
6.50	0.33	0.00	0.00
7.00	0.36	0.00	0.00
7.50	0.40	0.00	0.00
8.00	0.44	0.00	0.00
8.50	0.48	0.00	0.00
9.00	0.54	0.00	0.00
9.50	0.60	0.00	0.00
10.00	0.66	0.00	0.00
10.50	0.75	0.00	0.00
11.00	0.86	0.00	0.00
11.50	1.04	0.00	0.00
12.00	2.43	0.17	**4.92**
12.50	2.69	0.26	**1.01**
13.00	2.83	0.30	0.61
13.50	2.92	0.34	0.48
14.00	3.00	0.37	0.39
14.50	3.07	0.39	0.34
15.00	3.12	0.41	0.31
15.50	3.18	0.43	0.28
16.00	3.22	0.45	0.25
16.50	3.26	0.47	0.24
17.00	3.30	0.49	0.22
17.50	3.34	0.50	0.21
18.00	3.37	0.52	0.20
18.50	3.40	0.53	0.19
19.00	3.43	0.54	0.18
19.50	3.46	0.55	0.17
20.00	3.48	0.57	0.15
20.50	3.51	0.58	0.15
21.00	3.53	0.59	0.15
21.50	3.55	0.60	0.14
22.00	3.58	0.61	0.14
22.50	3.60	0.62	0.14
23.00	3.62	0.63	0.14
23.50	3.64	0.64	0.13
24.00	**3.66**	**0.65**	0.13
24.50	3.66	0.65	0.00
25.00	3.66	0.65	0.00
25.50	3.66	0.65	0.00
26.00	3.66	0.65	0.00
26.50	3.66	0.65	0.00
27.00	3.66	0.65	0.00
27.50	3.66	0.65	0.00
28.00	3.66	0.65	0.00
28.50	3.66	0.65	0.00
29.00	3.66	0.65	0.00
29.50	3.66	0.65	0.00
30.00	3.66	0.65	0.00

Summary for Subcatchment 31S: DA-2

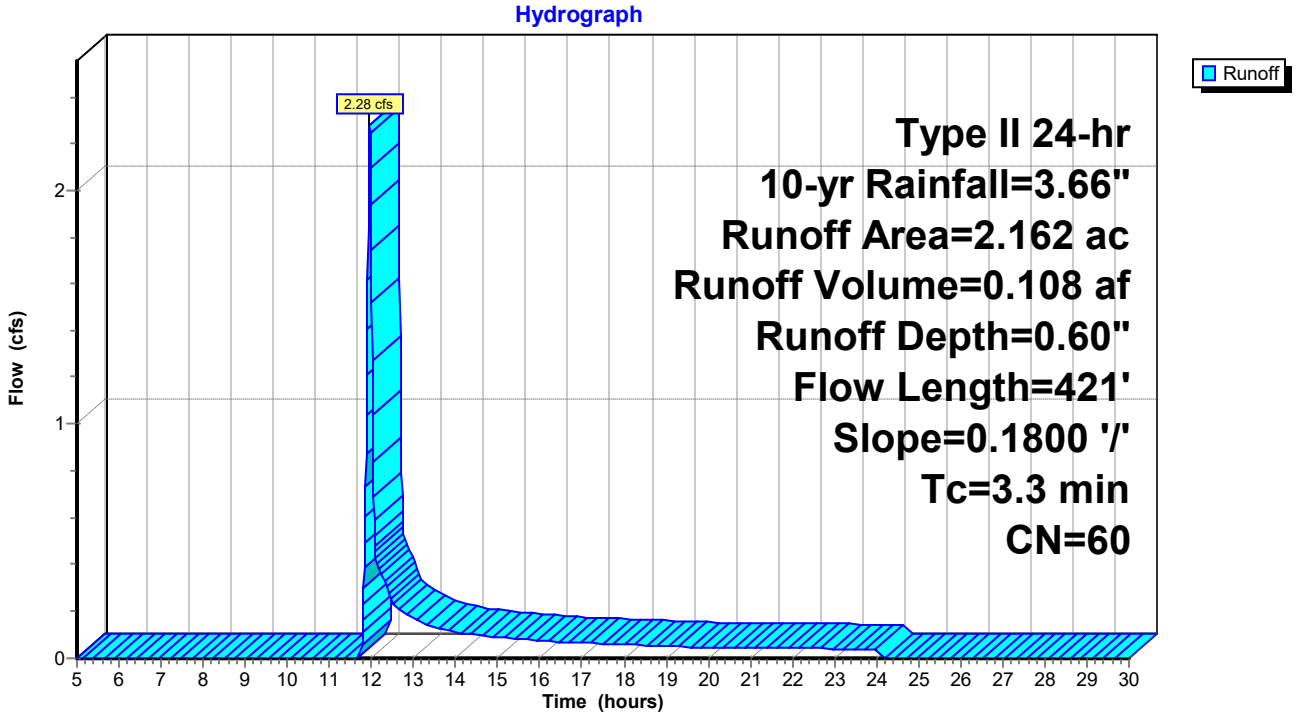
Runoff = 2.28 cfs @ 11.96 hrs, Volume= 0.108 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 31S: DA-2



Hydrograph for Subcatchment 31S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.23	0.00	0.00
5.50	0.26	0.00	0.00
6.00	0.29	0.00	0.00
6.50	0.33	0.00	0.00
7.00	0.36	0.00	0.00
7.50	0.40	0.00	0.00
8.00	0.44	0.00	0.00
8.50	0.48	0.00	0.00
9.00	0.54	0.00	0.00
9.50	0.60	0.00	0.00
10.00	0.66	0.00	0.00
10.50	0.75	0.00	0.00
11.00	0.86	0.00	0.00
11.50	1.04	0.00	**0.00**
12.00	2.43	0.15	**1.74**
12.50	2.69	0.23	0.24
13.00	2.83	0.27	0.17
13.50	2.92	0.31	0.13
14.00	3.00	0.33	0.11
14.50	3.07	0.36	0.10
15.00	3.12	0.38	0.09
15.50	3.18	0.40	0.08
16.00	3.22	0.42	0.07
16.50	3.26	0.43	0.07
17.00	3.30	0.45	0.07
17.50	3.34	0.46	0.06
18.00	3.37	0.48	0.06
18.50	3.40	0.49	0.06
19.00	3.43	0.50	0.05
19.50	3.46	0.51	0.05
20.00	3.48	0.52	0.04
20.50	3.51	0.53	0.04
21.00	3.53	0.54	0.04
21.50	3.55	0.55	0.04
22.00	3.58	0.56	0.04
22.50	3.60	0.57	0.04
23.00	3.62	0.58	0.04
23.50	3.64	0.59	0.04
24.00	**3.66**	**0.60**	0.04
24.50	3.66	0.60	0.00
25.00	3.66	0.60	0.00
25.50	3.66	0.60	0.00
26.00	3.66	0.60	0.00
26.50	3.66	0.60	0.00
27.00	3.66	0.60	0.00
27.50	3.66	0.60	0.00
28.00	3.66	0.60	0.00
28.50	3.66	0.60	0.00
29.00	3.66	0.60	0.00
29.50	3.66	0.60	0.00
30.00	3.66	0.60	0.00

Summary for Subcatchment 32S: DA-2

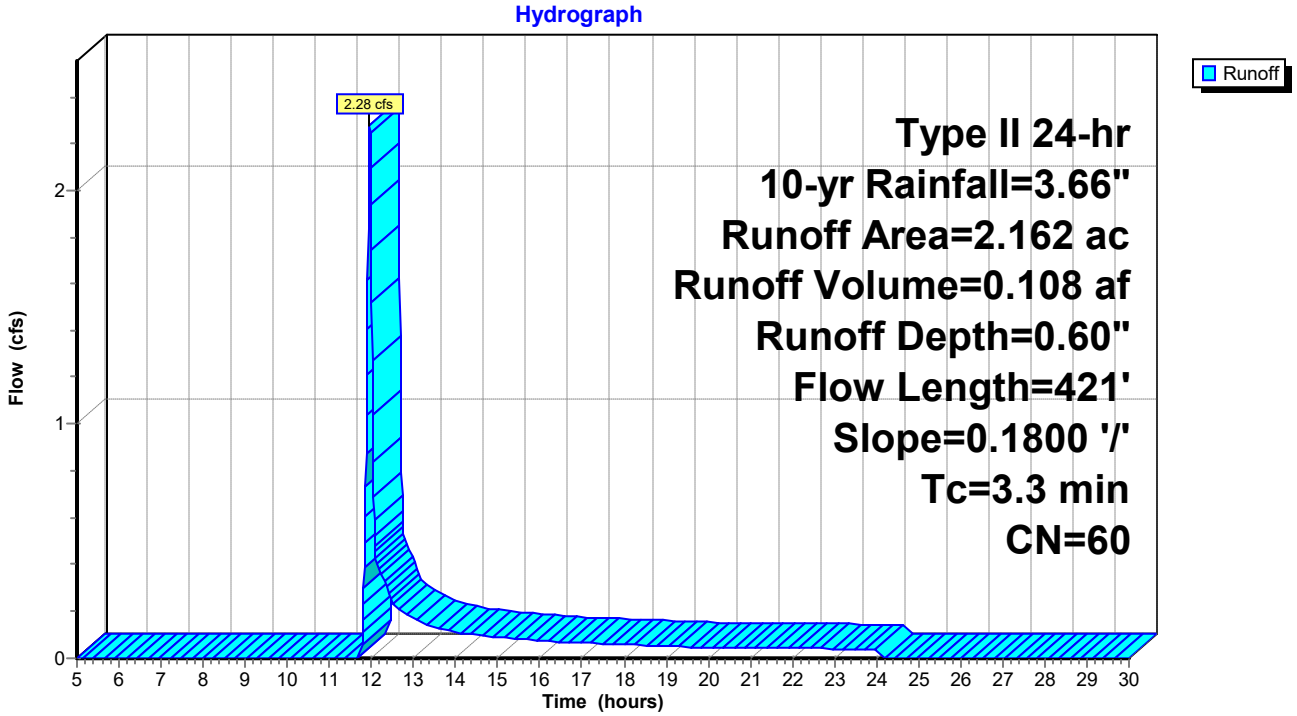
Runoff = 2.28 cfs @ 11.96 hrs, Volume= 0.108 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 32S: DA-2



Hydrograph for Subcatchment 32S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.23	0.00	0.00
5.50	0.26	0.00	0.00
6.00	0.29	0.00	0.00
6.50	0.33	0.00	0.00
7.00	0.36	0.00	0.00
7.50	0.40	0.00	0.00
8.00	0.44	0.00	0.00
8.50	0.48	0.00	0.00
9.00	0.54	0.00	0.00
9.50	0.60	0.00	0.00
10.00	0.66	0.00	0.00
10.50	0.75	0.00	0.00
11.00	0.86	0.00	0.00
11.50	1.04	0.00	**0.00**
12.00	2.43	0.15	**1.74**
12.50	2.69	0.23	0.24
13.00	2.83	0.27	0.17
13.50	2.92	0.31	0.13
14.00	3.00	0.33	0.11
14.50	3.07	0.36	0.10
15.00	3.12	0.38	0.09
15.50	3.18	0.40	0.08
16.00	3.22	0.42	0.07
16.50	3.26	0.43	0.07
17.00	3.30	0.45	0.07
17.50	3.34	0.46	0.06
18.00	3.37	0.48	0.06
18.50	3.40	0.49	0.06
19.00	3.43	0.50	0.05
19.50	3.46	0.51	0.05
20.00	3.48	0.52	0.04
20.50	3.51	0.53	0.04
21.00	3.53	0.54	0.04
21.50	3.55	0.55	0.04
22.00	3.58	0.56	0.04
22.50	3.60	0.57	0.04
23.00	3.62	0.58	0.04
23.50	3.64	0.59	0.04
24.00	**3.66**	**0.60**	0.04
24.50	3.66	0.60	0.00
25.00	3.66	0.60	0.00
25.50	3.66	0.60	0.00
26.00	3.66	0.60	0.00
26.50	3.66	0.60	0.00
27.00	3.66	0.60	0.00
27.50	3.66	0.60	0.00
28.00	3.66	0.60	0.00
28.50	3.66	0.60	0.00
29.00	3.66	0.60	0.00
29.50	3.66	0.60	0.00
30.00	3.66	0.60	0.00

Summary for Subcatchment 33S: DA-1

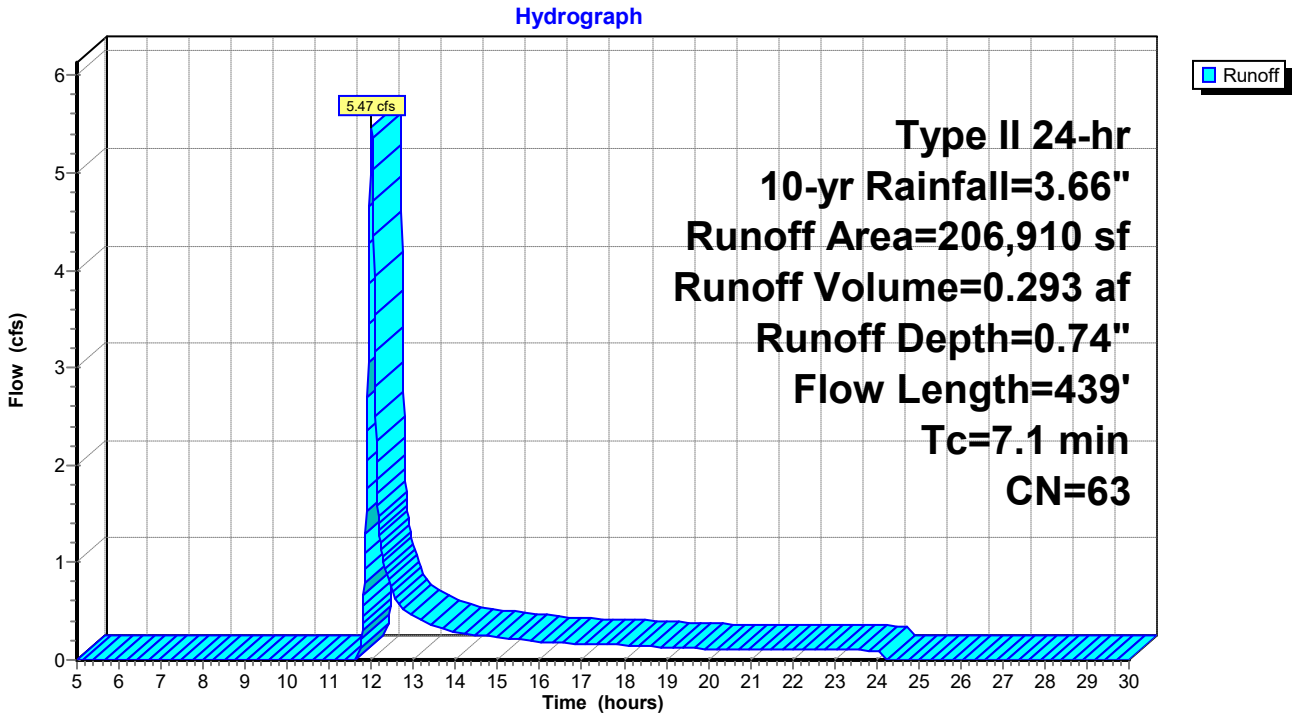
Runoff = 5.47 cfs @ 12.00 hrs, Volume= 0.293 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (sf)	CN	Description
36,765	58	Meadow, non-grazed, HSG B
144,924	60	Woods, Fair, HSG B
25,221	89	Paved roads w/open ditches, 50% imp, HSG B
206,910	63	Weighted Average
194,300		93.91% Pervious Area
12,611		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 33S: DA-1



Hydrograph for Subcatchment 33S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.23	0.00	0.00
5.50	0.26	0.00	0.00
6.00	0.29	0.00	0.00
6.50	0.33	0.00	0.00
7.00	0.36	0.00	0.00
7.50	0.40	0.00	0.00
8.00	0.44	0.00	0.00
8.50	0.48	0.00	0.00
9.00	0.54	0.00	0.00
9.50	0.60	0.00	0.00
10.00	0.66	0.00	0.00
10.50	0.75	0.00	0.00
11.00	0.86	0.00	0.00
11.50	1.04	0.00	0.00
12.00	2.43	0.22	**5.47**
12.50	2.69	0.31	0.71
13.00	2.83	0.36	0.45
13.50	2.92	0.40	0.35
14.00	3.00	0.43	0.29
14.50	3.07	0.46	0.26
15.00	3.12	0.49	0.23
15.50	3.18	0.51	0.21
16.00	3.22	0.53	0.19
16.50	3.26	0.55	0.18
17.00	3.30	0.56	0.17
17.50	3.34	0.58	0.16
18.00	3.37	0.60	0.15
18.50	3.40	0.61	0.14
19.00	3.43	0.63	0.13
19.50	3.46	0.64	0.12
20.00	3.48	0.65	0.11
20.50	3.51	0.66	0.11
21.00	3.53	0.67	0.11
21.50	3.55	0.69	0.11
22.00	3.58	0.70	0.10
22.50	3.60	0.71	0.10
23.00	3.62	0.72	0.10
23.50	3.64	0.73	0.10
24.00	**3.66**	**0.74**	0.10
24.50	3.66	0.74	0.00
25.00	3.66	0.74	0.00
25.50	3.66	0.74	0.00
26.00	3.66	0.74	0.00
26.50	3.66	0.74	0.00
27.00	3.66	0.74	0.00
27.50	3.66	0.74	0.00
28.00	3.66	0.74	0.00
28.50	3.66	0.74	0.00
29.00	3.66	0.74	0.00
29.50	3.66	0.74	0.00
30.00	3.66	0.74	0.00

Summary for Subcatchment 34S: DA-1

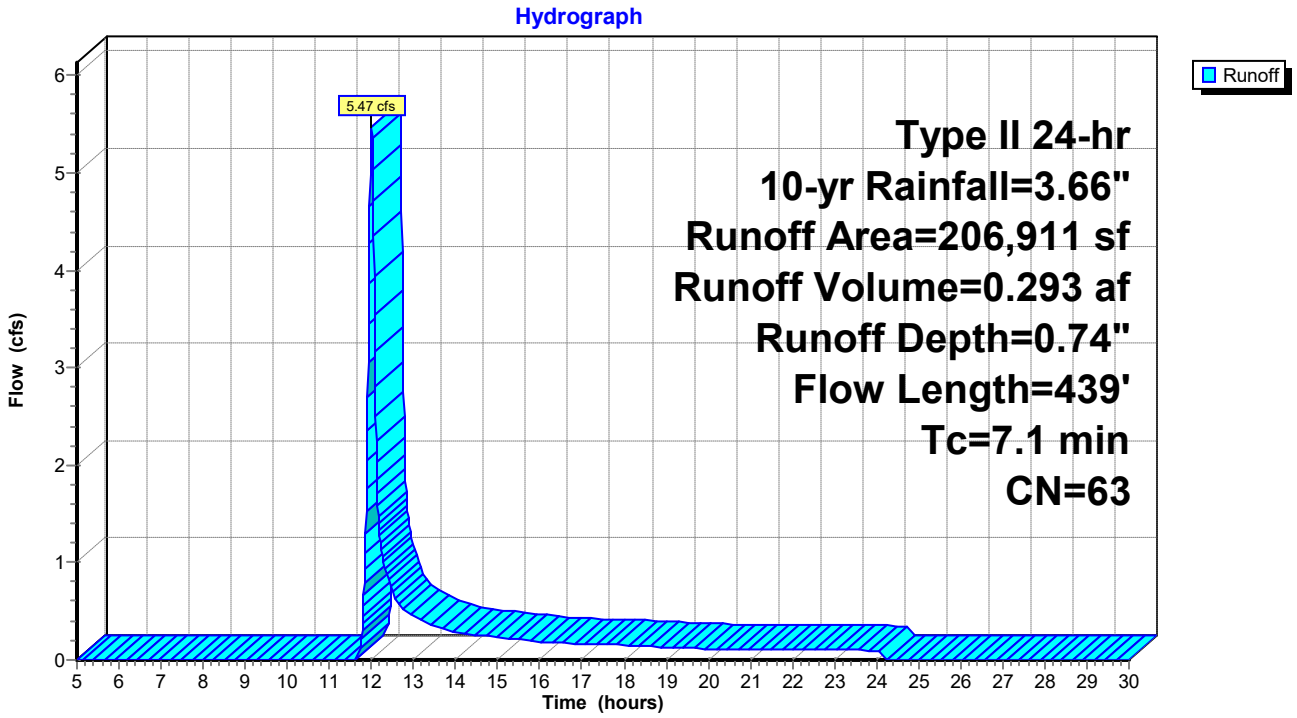
Runoff = 5.47 cfs @ 12.00 hrs, Volume= 0.293 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.66"

Area (sf)	CN	Description
36,785	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
25,207	89	Paved roads w/open ditches, 50% imp, HSG B
206,911	63	Weighted Average
194,308		93.91% Pervious Area
12,604		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 34S: DA-1



Hydrograph for Subcatchment 34S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.23	0.00	0.00
5.50	0.26	0.00	0.00
6.00	0.29	0.00	0.00
6.50	0.33	0.00	0.00
7.00	0.36	0.00	0.00
7.50	0.40	0.00	0.00
8.00	0.44	0.00	0.00
8.50	0.48	0.00	0.00
9.00	0.54	0.00	0.00
9.50	0.60	0.00	0.00
10.00	0.66	0.00	0.00
10.50	0.75	0.00	0.00
11.00	0.86	0.00	0.00
11.50	1.04	0.00	0.00
12.00	2.43	0.22	**5.47**
12.50	2.69	0.31	0.71
13.00	2.83	0.36	0.45
13.50	2.92	0.40	0.35
14.00	3.00	0.43	0.29
14.50	3.07	0.46	0.26
15.00	3.12	0.49	0.23
15.50	3.18	0.51	0.21
16.00	3.22	0.53	0.19
16.50	3.26	0.55	0.18
17.00	3.30	0.56	0.17
17.50	3.34	0.58	0.16
18.00	3.37	0.60	0.15
18.50	3.40	0.61	0.14
19.00	3.43	0.63	0.13
19.50	3.46	0.64	0.12
20.00	3.48	0.65	0.11
20.50	3.51	0.66	0.11
21.00	3.53	0.67	0.11
21.50	3.55	0.69	0.11
22.00	3.58	0.70	0.10
22.50	3.60	0.71	0.10
23.00	3.62	0.72	0.10
23.50	3.64	0.73	0.10
24.00	**3.66**	**0.74**	0.10
24.50	3.66	0.74	0.00
25.00	3.66	0.74	0.00
25.50	3.66	0.74	0.00
26.00	3.66	0.74	0.00
26.50	3.66	0.74	0.00
27.00	3.66	0.74	0.00
27.50	3.66	0.74	0.00
28.00	3.66	0.74	0.00
28.50	3.66	0.74	0.00
29.00	3.66	0.74	0.00
29.50	3.66	0.74	0.00
30.00	3.66	0.74	0.00

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area =	4.750 ac,	6.09% Impervious,	Inflow Depth =	0.74"	for 10-yr event
Inflow =	5.47 cfs @	12.00 hrs,	Volume=	0.293 af	
Outflow =	0.24 cfs @	14.90 hrs,	Volume=	0.107 af,	Atten= 96%, Lag= 173.8 min
Primary =	0.24 cfs @	14.90 hrs,	Volume=	0.107 af	

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,689.51' @ 14.90 hrs Surf.Area= 0.142 ac Storage= 0.186 af

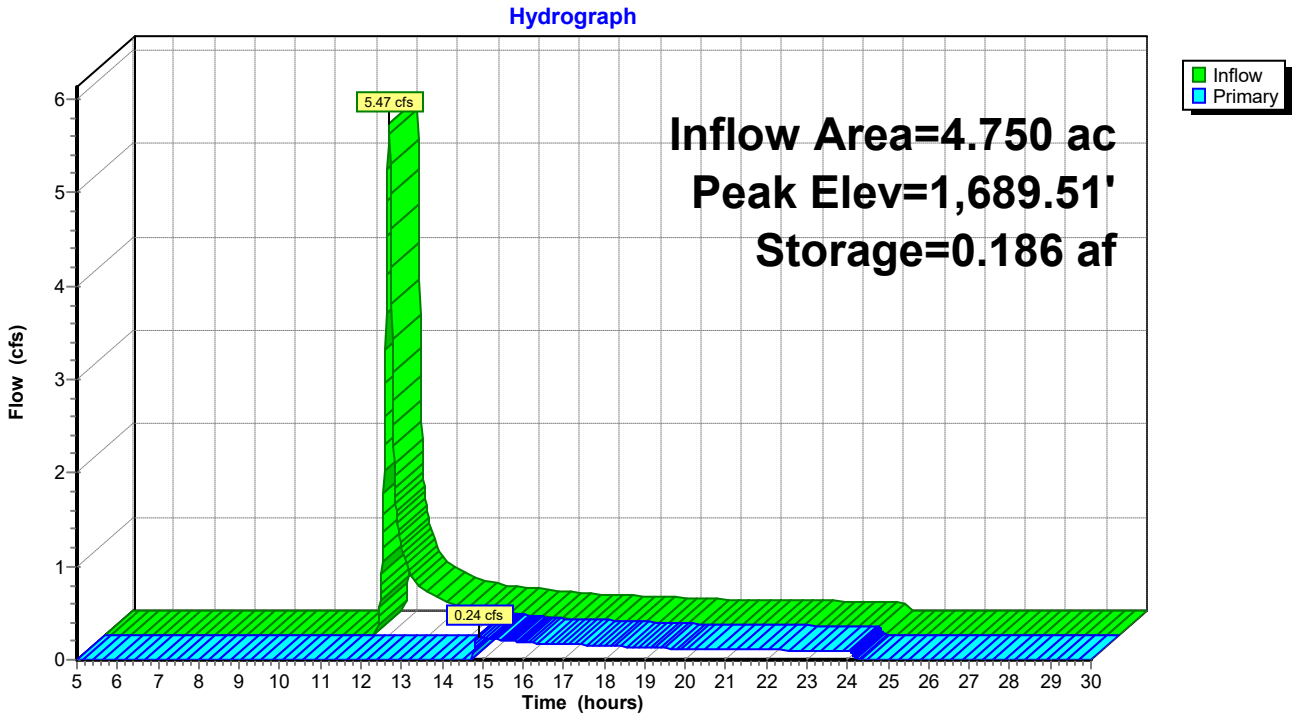
Plug-Flow detention time= 403.2 min calculated for 0.107 af (37% of inflow)
Center-of-Mass det. time= 236.0 min (1,125.2 - 889.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,688.00'	0.200 af	**20.00'W x 231.00'L x 1.60'H Prismatoid Z=2.0**

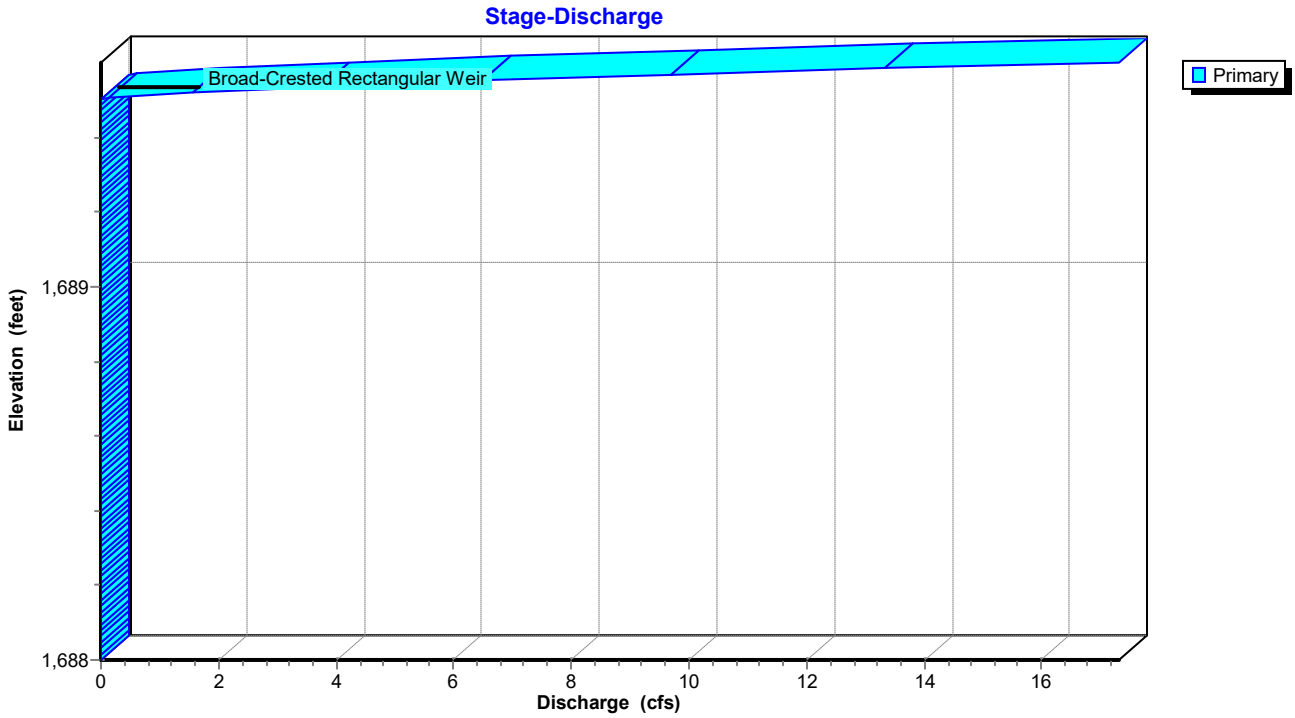
Device	Routing	Invert	Outlet Devices
#1	Primary	1,689.50'	**231.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.20 cfs @ 14.90 hrs HW=1,689.51' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.20 cfs @ 0.17 fps)

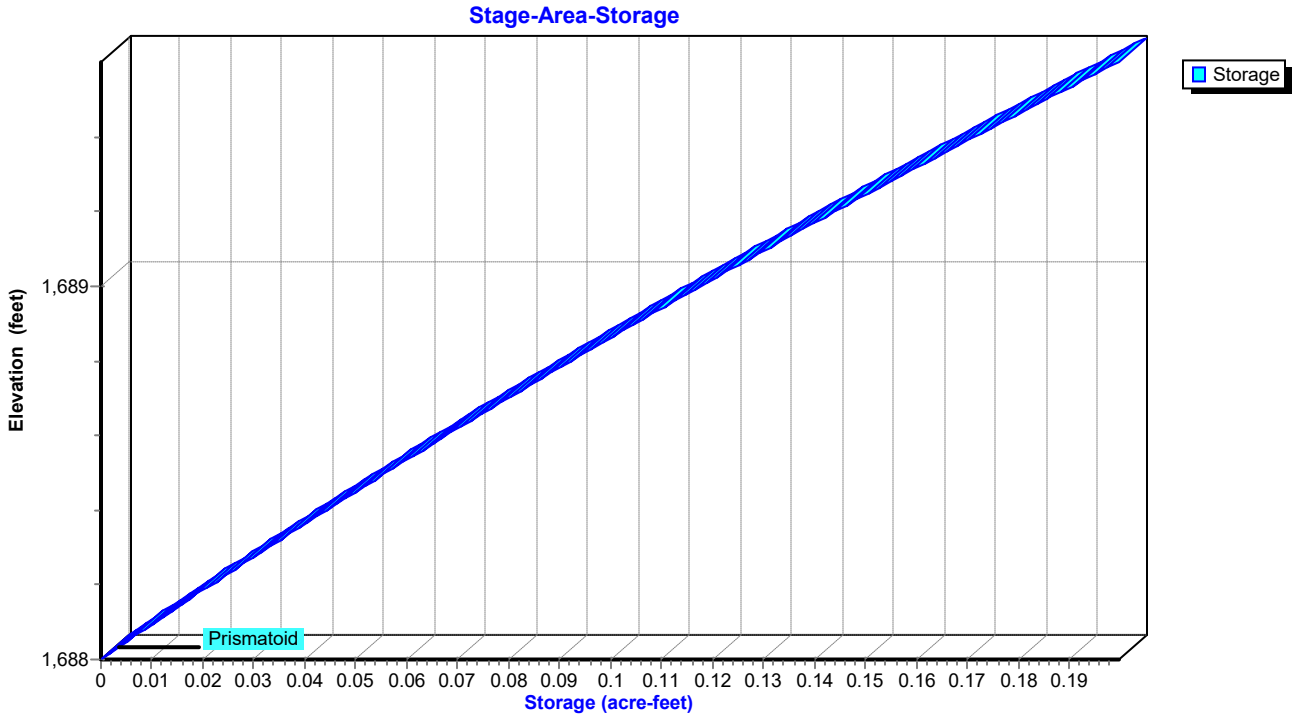
Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0.000	1,688.00	0.00
5.50	0.00	0.000	1,688.00	0.00
6.00	0.00	0.000	1,688.00	0.00
6.50	0.00	0.000	1,688.00	0.00
7.00	0.00	0.000	1,688.00	0.00
7.50	0.00	0.000	1,688.00	0.00
8.00	0.00	0.000	1,688.00	0.00
8.50	0.00	0.000	1,688.00	0.00
9.00	0.00	0.000	1,688.00	0.00
9.50	0.00	0.000	1,688.00	0.00
10.00	0.00	0.000	1,688.00	0.00
10.50	0.00	0.000	1,688.00	0.00
11.00	0.00	0.000	1,688.00	0.00
11.50	0.00	0.000	1,688.00	0.00
12.00	**5.47**	0.046	1,688.41	0.00
12.50	0.71	0.117	1,689.00	0.00
13.00	0.45	0.139	1,689.17	0.00
13.50	0.35	0.156	1,689.29	0.00
14.00	0.29	0.169	1,689.38	0.00
14.50	0.26	**0.180**	**1,689.46**	**0.00**
15.00	0.23	**0.186**	**1,689.51**	**0.24**
15.50	0.21	0.186	1,689.50	0.21
16.00	0.19	0.186	1,689.50	0.19
16.50	0.18	0.186	1,689.50	0.18
17.00	0.17	0.186	1,689.50	0.17
17.50	0.16	0.186	1,689.50	0.16
18.00	0.15	0.186	1,689.50	0.15
18.50	0.14	0.186	1,689.50	0.14
19.00	0.13	0.186	1,689.50	0.13
19.50	0.12	0.186	1,689.50	0.12
20.00	0.11	0.186	1,689.50	0.11
20.50	0.11	0.186	1,689.50	0.11
21.00	0.11	0.186	1,689.50	0.11
21.50	0.11	0.186	1,689.50	0.11
22.00	0.10	0.186	1,689.50	0.10
22.50	0.10	0.186	1,689.50	0.10
23.00	0.10	0.186	1,689.50	0.10
23.50	0.10	0.186	1,689.50	0.10
24.00	0.10	0.186	1,689.50	0.10
24.50	0.00	0.185	1,689.50	0.00
25.00	0.00	0.185	1,689.50	0.00
25.50	0.00	0.185	1,689.50	0.00
26.00	0.00	0.185	1,689.50	0.00
26.50	0.00	0.185	1,689.50	0.00
27.00	0.00	0.185	1,689.50	0.00
27.50	0.00	0.185	1,689.50	0.00
28.00	0.00	0.185	1,689.50	0.00
28.50	0.00	0.185	1,689.50	0.00
29.00	0.00	0.185	1,689.50	0.00
29.50	0.00	0.185	1,689.50	0.00
30.00	0.00	0.185	1,689.50	0.00

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

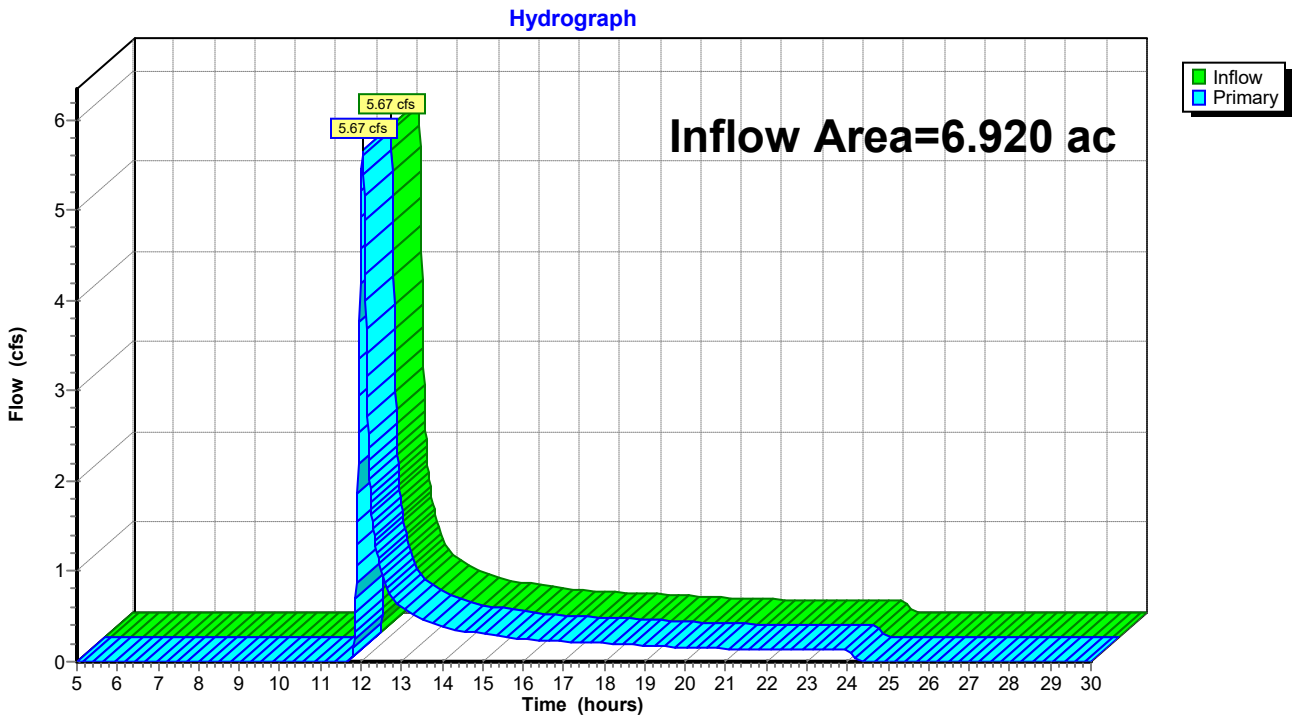
Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,688.00	0.00	1,688.51	0.00	1,689.02	0.00	1,689.53	2.84
1,688.01	0.00	1,688.52	0.00	1,689.03	0.00	1,689.54	4.38
1,688.02	0.00	1,688.53	0.00	1,689.04	0.00	1,689.55	6.12
1,688.03	0.00	1,688.54	0.00	1,689.05	0.00	1,689.56	8.05
1,688.04	0.00	1,688.55	0.00	1,689.06	0.00	1,689.57	10.14
1,688.05	0.00	1,688.56	0.00	1,689.07	0.00	1,689.58	12.39
1,688.06	0.00	1,688.57	0.00	1,689.08	0.00	1,689.59	14.78
1,688.07	0.00	1,688.58	0.00	1,689.09	0.00	1,689.60	**17.31**
1,688.08	0.00	1,688.59	0.00	1,689.10	0.00		
1,688.09	0.00	1,688.60	0.00	1,689.11	0.00		
1,688.10	0.00	1,688.61	0.00	1,689.12	0.00		
1,688.11	0.00	1,688.62	0.00	1,689.13	0.00		
1,688.12	0.00	1,688.63	0.00	1,689.14	0.00		
1,688.13	0.00	1,688.64	0.00	1,689.15	0.00		
1,688.14	0.00	1,688.65	0.00	1,689.16	0.00		
1,688.15	0.00	1,688.66	0.00	1,689.17	0.00		
1,688.16	0.00	1,688.67	0.00	1,689.18	0.00		
1,688.17	0.00	1,688.68	0.00	1,689.19	0.00		
1,688.18	0.00	1,688.69	0.00	1,689.20	0.00		
1,688.19	0.00	1,688.70	0.00	1,689.21	0.00		
1,688.20	0.00	1,688.71	0.00	1,689.22	0.00		
1,688.21	0.00	1,688.72	0.00	1,689.23	0.00		
1,688.22	0.00	1,688.73	0.00	1,689.24	0.00		
1,688.23	0.00	1,688.74	0.00	1,689.25	0.00		
1,688.24	0.00	1,688.75	0.00	1,689.26	0.00		
1,688.25	0.00	1,688.76	0.00	1,689.27	0.00		
1,688.26	0.00	1,688.77	0.00	1,689.28	0.00		
1,688.27	0.00	1,688.78	0.00	1,689.29	0.00		
1,688.28	0.00	1,688.79	0.00	1,689.30	0.00		
1,688.29	0.00	1,688.80	0.00	1,689.31	0.00		
1,688.30	0.00	1,688.81	0.00	1,689.32	0.00		
1,688.31	0.00	1,688.82	0.00	1,689.33	0.00		
1,688.32	0.00	1,688.83	0.00	1,689.34	0.00		
1,688.33	0.00	1,688.84	0.00	1,689.35	0.00		
1,688.34	0.00	1,688.85	0.00	1,689.36	0.00		
1,688.35	0.00	1,688.86	0.00	1,689.37	0.00		
1,688.36	0.00	1,688.87	0.00	1,689.38	0.00		
1,688.37	0.00	1,688.88	0.00	1,689.39	0.00		
1,688.38	0.00	1,688.89	0.00	1,689.40	0.00		
1,688.39	0.00	1,688.90	0.00	1,689.41	0.00		
1,688.40	0.00	1,688.91	0.00	1,689.42	0.00		
1,688.41	0.00	1,688.92	0.00	1,689.43	0.00		
1,688.42	0.00	1,688.93	0.00	1,689.44	0.00		
1,688.43	0.00	1,688.94	0.00	1,689.45	0.00		
1,688.44	0.00	1,688.95	0.00	1,689.46	0.00		
1,688.45	0.00	1,688.96	0.00	1,689.47	0.00		
1,688.46	0.00	1,688.97	0.00	1,689.48	0.00		
1,688.47	0.00	1,688.98	0.00	1,689.49	0.00		
1,688.48	0.00	1,688.99	0.00	1,689.50	0.00		
1,688.49	0.00	1,689.00	0.00	1,689.51	0.55		
1,688.50	0.00	1,689.01	0.00	1,689.52	1.55		

Summary for Link 3L: Pre

Inflow Area = 6.920 ac, 3.63% Impervious, Inflow Depth = 0.65" for 10-yr event
Inflow = 5.67 cfs @ 12.04 hrs, Volume= 0.373 af
Primary = 5.67 cfs @ 12.04 hrs, Volume= 0.373 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 3L: Pre



Hydrograph for Link 3L: Pre

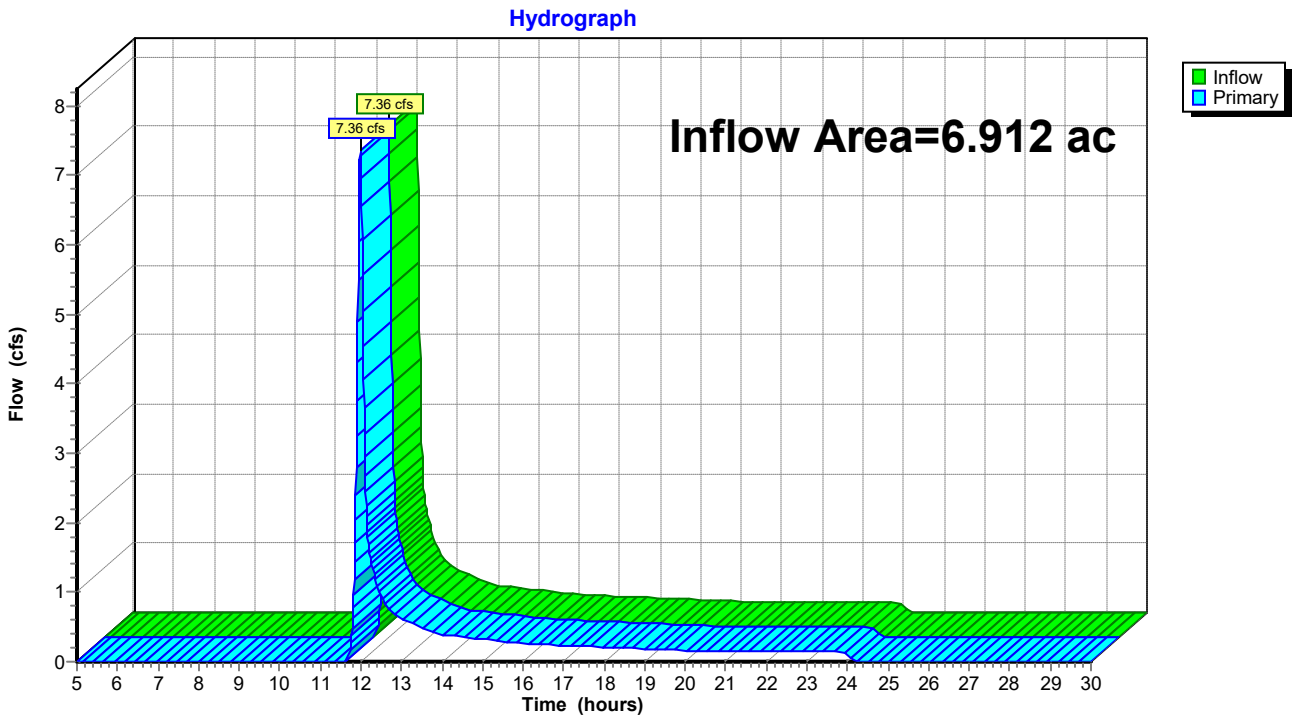
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.00	0.00	0.00
12.00	**4.92**	0.00	**4.92**
12.50	**1.01**	0.00	**1.01**
13.00	0.61	0.00	0.61
13.50	0.48	0.00	0.48
14.00	0.39	0.00	0.39
14.50	0.34	0.00	0.34
15.00	0.31	0.00	0.31
15.50	0.28	0.00	0.28
16.00	0.25	0.00	0.25
16.50	0.24	0.00	0.24
17.00	0.22	0.00	0.22
17.50	0.21	0.00	0.21
18.00	0.20	0.00	0.20
18.50	0.19	0.00	0.19
19.00	0.18	0.00	0.18
19.50	0.17	0.00	0.17
20.00	0.15	0.00	0.15
20.50	0.15	0.00	0.15
21.00	0.15	0.00	0.15
21.50	0.14	0.00	0.14
22.00	0.14	0.00	0.14
22.50	0.14	0.00	0.14
23.00	0.14	0.00	0.14
23.50	0.13	0.00	0.13
24.00	0.13	0.00	0.13
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 6L: Post

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 0.70" for 10-yr event
Inflow = 7.36 cfs @ 11.99 hrs, Volume= 0.401 af
Primary = 7.36 cfs @ 11.99 hrs, Volume= 0.401 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 6L: Post



Hydrograph for Link 6L: Post

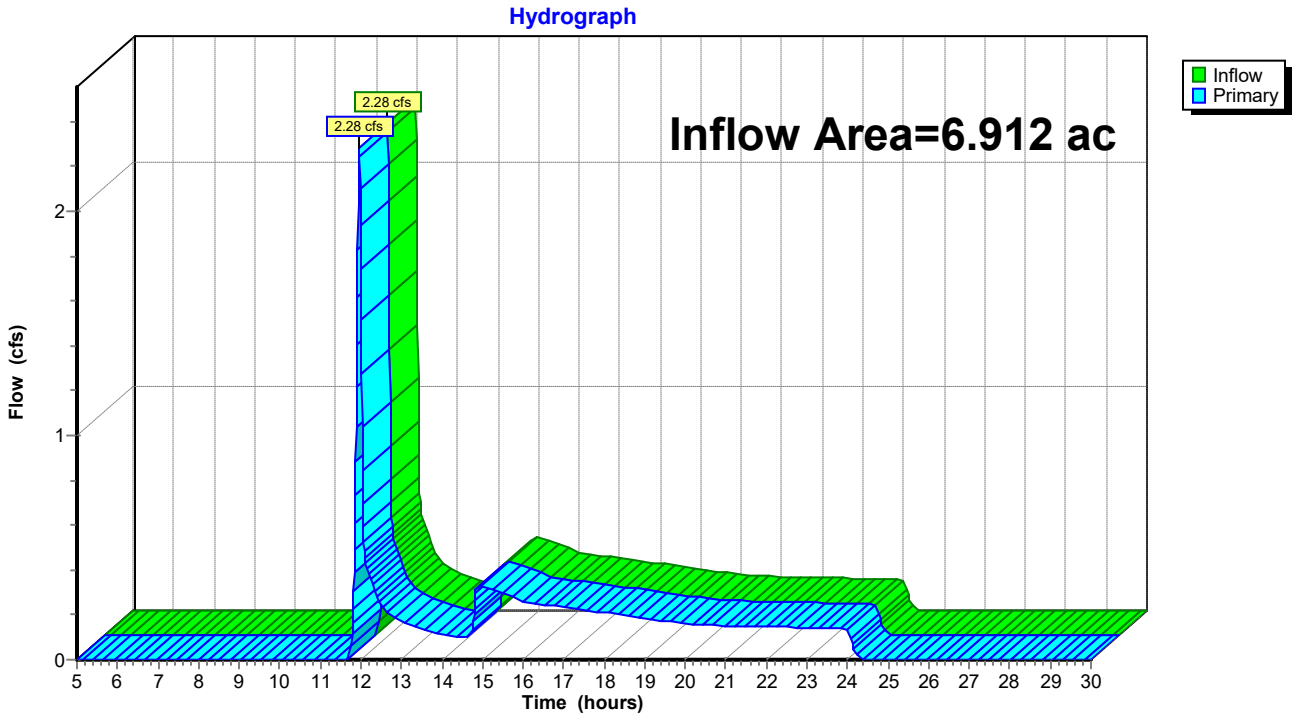
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	**0.00**	0.00	**0.00**
12.00	**7.22**	0.00	**7.22**
12.50	0.95	0.00	0.95
13.00	0.62	0.00	0.62
13.50	0.49	0.00	0.49
14.00	0.39	0.00	0.39
14.50	0.36	0.00	0.36
15.00	0.33	0.00	0.33
15.50	0.29	0.00	0.29
16.00	0.26	0.00	0.26
16.50	0.24	0.00	0.24
17.00	0.23	0.00	0.23
17.50	0.22	0.00	0.22
18.00	0.21	0.00	0.21
18.50	0.20	0.00	0.20
19.00	0.18	0.00	0.18
19.50	0.17	0.00	0.17
20.00	0.16	0.00	0.16
20.50	0.15	0.00	0.15
21.00	0.15	0.00	0.15
21.50	0.15	0.00	0.15
22.00	0.15	0.00	0.15
22.50	0.14	0.00	0.14
23.00	0.14	0.00	0.14
23.50	0.14	0.00	0.14
24.00	0.14	0.00	0.14
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 15L: Post w/BMP

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 0.37" for 10-yr event
Inflow = 2.28 cfs @ 11.96 hrs, Volume= 0.216 af
Primary = 2.28 cfs @ 11.96 hrs, Volume= 0.216 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 15L: Post w/BMP



Hydrograph for Link 15L: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	**0.00**	0.00	**0.00**
12.00	**1.74**	0.00	**1.74**
12.50	0.24	0.00	0.24
13.00	0.17	0.00	0.17
13.50	0.13	0.00	0.13
14.00	0.11	0.00	0.11
14.50	0.10	0.00	0.10
15.00	0.33	0.00	0.33
15.50	0.29	0.00	0.29
16.00	0.26	0.00	0.26
16.50	0.25	0.00	0.25
17.00	0.23	0.00	0.23
17.50	0.22	0.00	0.22
18.00	0.21	0.00	0.21
18.50	0.20	0.00	0.20
19.00	0.19	0.00	0.19
19.50	0.17	0.00	0.17
20.00	0.16	0.00	0.16
20.50	0.15	0.00	0.15
21.00	0.15	0.00	0.15
21.50	0.15	0.00	0.15
22.00	0.15	0.00	0.15
22.50	0.14	0.00	0.14
23.00	0.14	0.00	0.14
23.50	0.14	0.00	0.14
24.00	0.14	0.00	0.14
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Time span=5.00-30.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 27S: DA-1 Runoff Area=301,436 sf 3.63% Impervious Runoff Depth=1.00"
Flow Length=860' Tc=10.4 min CN=61 Runoff=9.63 cfs 0.578 af

Subcatchment 31S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=0.95"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=3.85 cfs 0.170 af

Subcatchment 32S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=0.95"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=3.85 cfs 0.170 af

Subcatchment 33S: DA-1 Runoff Area=206,910 sf 6.09% Impervious Runoff Depth=1.12"
Flow Length=439' Tc=7.1 min CN=63 Runoff=8.76 cfs 0.443 af

Subcatchment 34S: DA-1 Runoff Area=206,911 sf 6.09% Impervious Runoff Depth=1.12"
Flow Length=439' Tc=7.1 min CN=63 Runoff=8.76 cfs 0.443 af

Pond 16P: Infiltration Berm+Amended Soil Peak Elev=1,689.52' Storage=0.188 af Inflow=8.76 cfs 0.443 af
Outflow=1.14 cfs 0.258 af

Link 3L: Pre Inflow=9.63 cfs 0.578 af
Primary=9.63 cfs 0.578 af

Link 6L: Post Inflow=11.97 cfs 0.614 af
Primary=11.97 cfs 0.614 af

Link 15L: Post w/BMP Inflow=3.85 cfs 0.428 af
Primary=3.85 cfs 0.428 af

Total Runoff Area = 20.744 ac Runoff Volume = 1.805 af Average Runoff Depth = 1.04"
96.00% Pervious = 19.914 ac 4.00% Impervious = 0.830 ac

Summary for Subcatchment 27S: DA-1

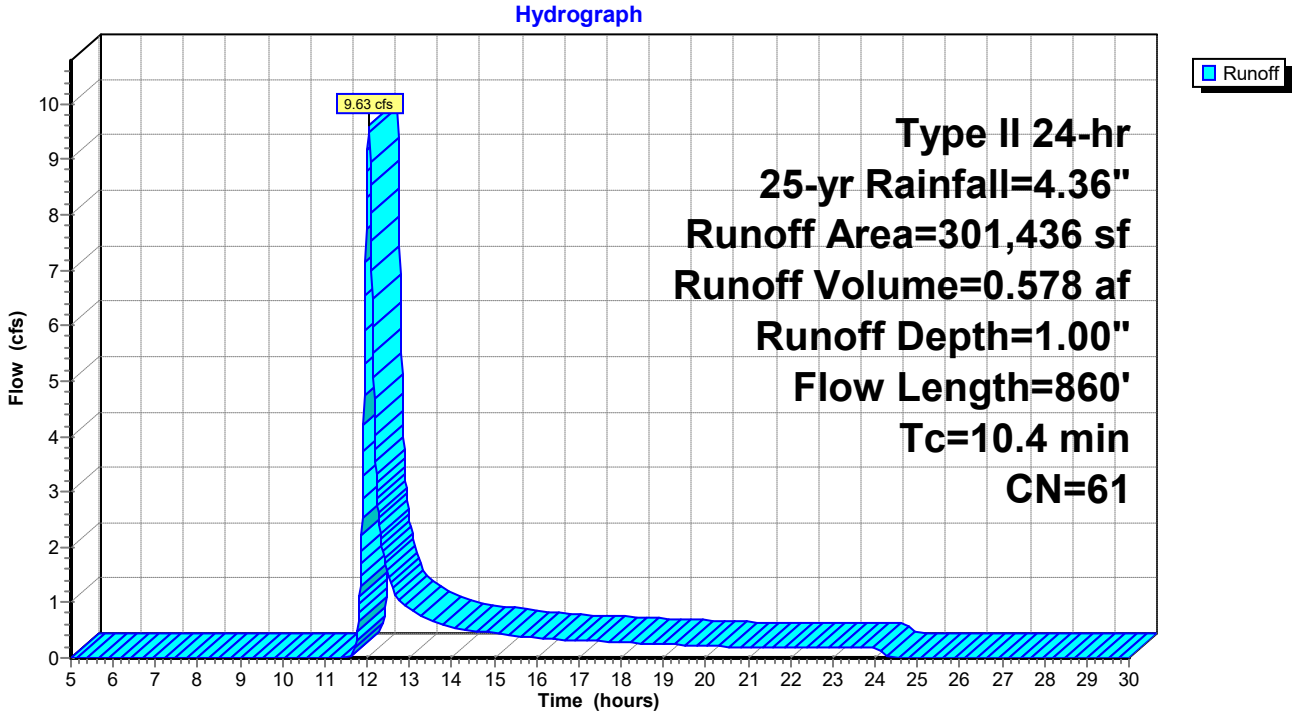
Runoff = 9.63 cfs @ 12.04 hrs, Volume= 0.578 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (sf)	CN	Description
134,617	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
21,900	89	Paved roads w/open ditches, 50% imp, HSG B
301,436	61	Weighted Average
290,486		96.37% Pervious Area
10,950		3.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	860	Total			

Subcatchment 27S: DA-1



Hydrograph for Subcatchment 27S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	0.00
12.00	2.89	0.32	**8.79**
12.50	3.20	0.45	**1.50**
13.00	3.37	0.51	0.90
13.50	3.48	0.57	0.69
14.00	3.58	0.61	0.56
14.50	3.65	0.64	0.49
15.00	3.72	0.68	0.45
15.50	3.78	0.70	0.40
16.00	3.84	0.73	0.36
16.50	3.89	0.76	0.33
17.00	3.93	0.78	0.32
17.50	3.97	0.80	0.30
18.00	4.02	0.82	0.28
18.50	4.05	0.84	0.27
19.00	4.09	0.86	0.25
19.50	4.12	0.87	0.23
20.00	4.15	0.89	0.21
20.50	4.18	0.90	0.21
21.00	4.21	0.92	0.20
21.50	4.23	0.93	0.20
22.00	4.26	0.95	0.20
22.50	4.29	0.96	0.19
23.00	4.31	0.98	0.19
23.50	4.34	0.99	0.19
24.00	**4.36**	**1.00**	0.18
24.50	4.36	1.00	0.00
25.00	4.36	1.00	0.00
25.50	4.36	1.00	0.00
26.00	4.36	1.00	0.00
26.50	4.36	1.00	0.00
27.00	4.36	1.00	0.00
27.50	4.36	1.00	0.00
28.00	4.36	1.00	0.00
28.50	4.36	1.00	0.00
29.00	4.36	1.00	0.00
29.50	4.36	1.00	0.00
30.00	4.36	1.00	0.00

Summary for Subcatchment 31S: DA-2

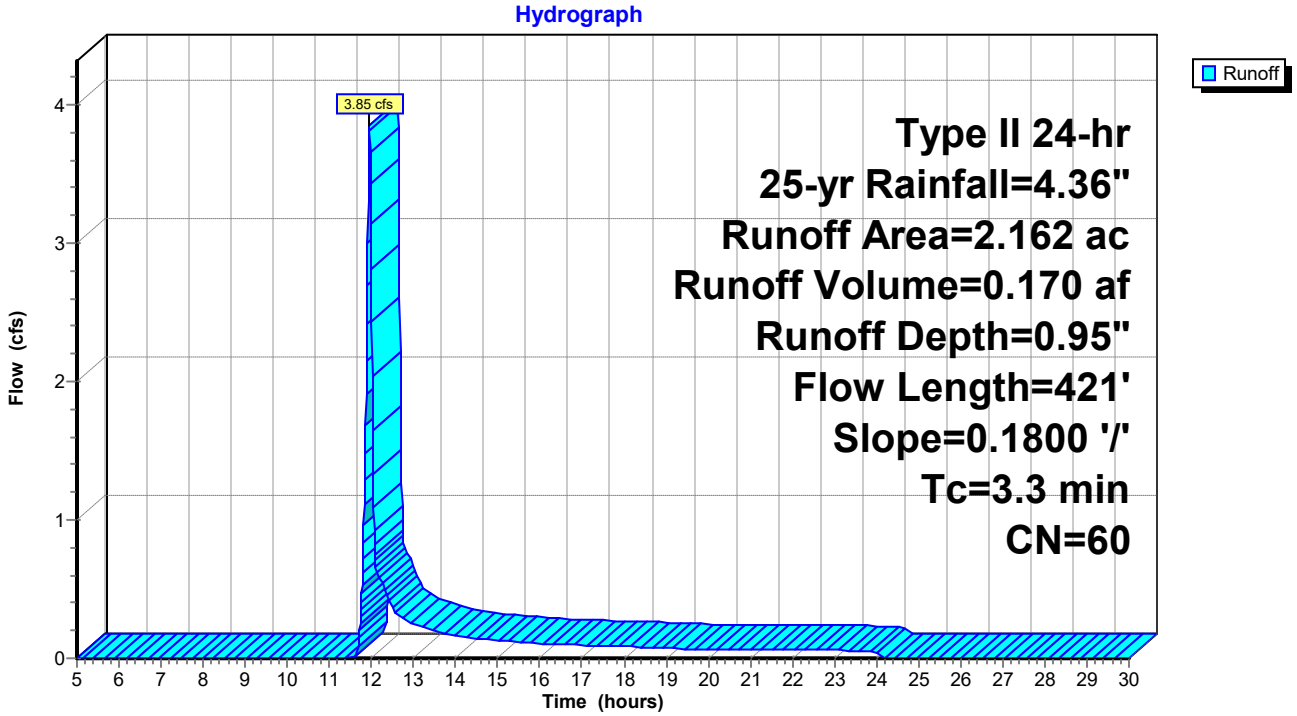
Runoff = 3.85 cfs @ 11.95 hrs, Volume= 0.170 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 31S: DA-2



Hydrograph for Subcatchment 31S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	**0.00**
12.00	2.89	0.29	**2.80**
12.50	3.20	0.41	0.36
13.00	3.37	0.47	0.25
13.50	3.48	0.52	0.20
14.00	3.58	0.56	0.16
14.50	3.65	0.60	0.14
15.00	3.72	0.63	0.13
15.50	3.78	0.66	0.12
16.00	3.84	0.68	0.10
16.50	3.89	0.71	0.10
17.00	3.93	0.73	0.09
17.50	3.97	0.75	0.09
18.00	4.02	0.77	0.08
18.50	4.05	0.79	0.08
19.00	4.09	0.81	0.07
19.50	4.12	0.82	0.07
20.00	4.15	0.84	0.06
20.50	4.18	0.85	0.06
21.00	4.21	0.87	0.06
21.50	4.23	0.88	0.06
22.00	4.26	0.89	0.06
22.50	4.29	0.91	0.06
23.00	4.31	0.92	0.06
23.50	4.34	0.93	0.06
24.00	**4.36**	**0.95**	0.06
24.50	4.36	0.95	0.00
25.00	4.36	0.95	0.00
25.50	4.36	0.95	0.00
26.00	4.36	0.95	0.00
26.50	4.36	0.95	0.00
27.00	4.36	0.95	0.00
27.50	4.36	0.95	0.00
28.00	4.36	0.95	0.00
28.50	4.36	0.95	0.00
29.00	4.36	0.95	0.00
29.50	4.36	0.95	0.00
30.00	4.36	0.95	0.00

Summary for Subcatchment 32S: DA-2

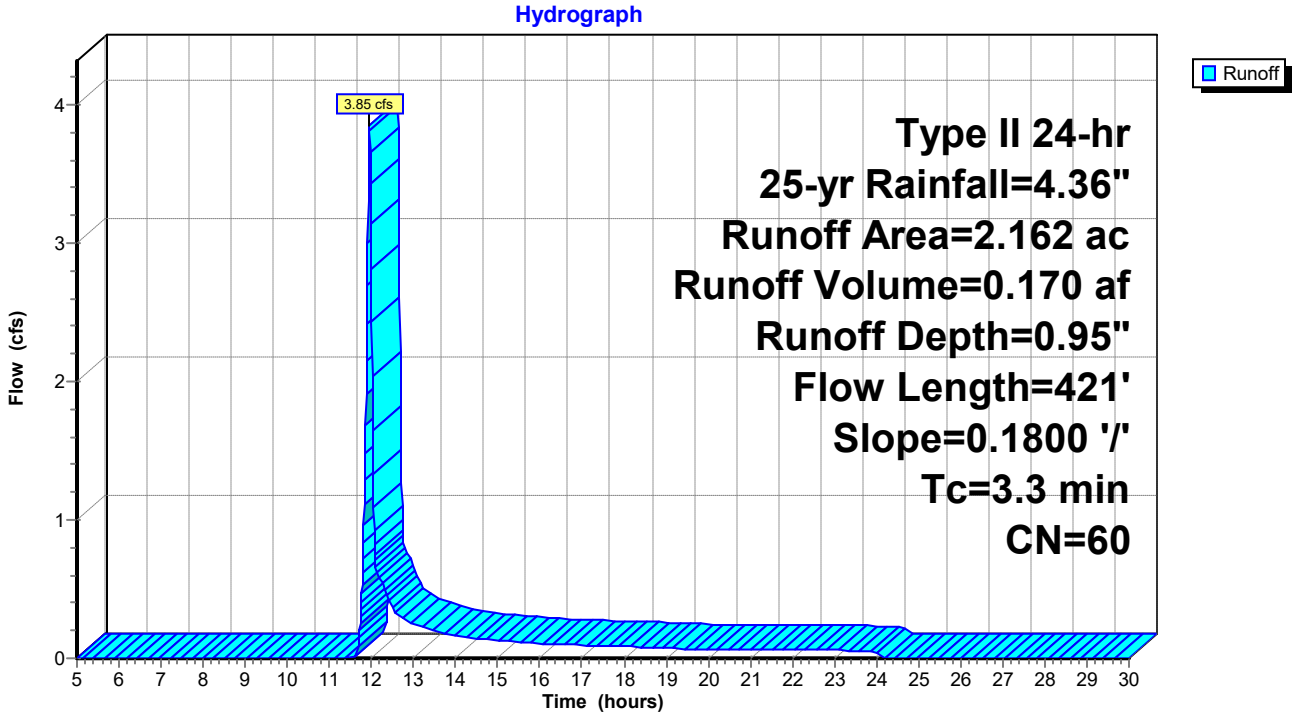
Runoff = 3.85 cfs @ 11.95 hrs, Volume= 0.170 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 32S: DA-2



Hydrograph for Subcatchment 32S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	**0.00**
12.00	2.89	0.29	**2.80**
12.50	3.20	0.41	0.36
13.00	3.37	0.47	0.25
13.50	3.48	0.52	0.20
14.00	3.58	0.56	0.16
14.50	3.65	0.60	0.14
15.00	3.72	0.63	0.13
15.50	3.78	0.66	0.12
16.00	3.84	0.68	0.10
16.50	3.89	0.71	0.10
17.00	3.93	0.73	0.09
17.50	3.97	0.75	0.09
18.00	4.02	0.77	0.08
18.50	4.05	0.79	0.08
19.00	4.09	0.81	0.07
19.50	4.12	0.82	0.07
20.00	4.15	0.84	0.06
20.50	4.18	0.85	0.06
21.00	4.21	0.87	0.06
21.50	4.23	0.88	0.06
22.00	4.26	0.89	0.06
22.50	4.29	0.91	0.06
23.00	4.31	0.92	0.06
23.50	4.34	0.93	0.06
24.00	**4.36**	**0.95**	0.06
24.50	4.36	0.95	0.00
25.00	4.36	0.95	0.00
25.50	4.36	0.95	0.00
26.00	4.36	0.95	0.00
26.50	4.36	0.95	0.00
27.00	4.36	0.95	0.00
27.50	4.36	0.95	0.00
28.00	4.36	0.95	0.00
28.50	4.36	0.95	0.00
29.00	4.36	0.95	0.00
29.50	4.36	0.95	0.00
30.00	4.36	0.95	0.00

Summary for Subcatchment 33S: DA-1

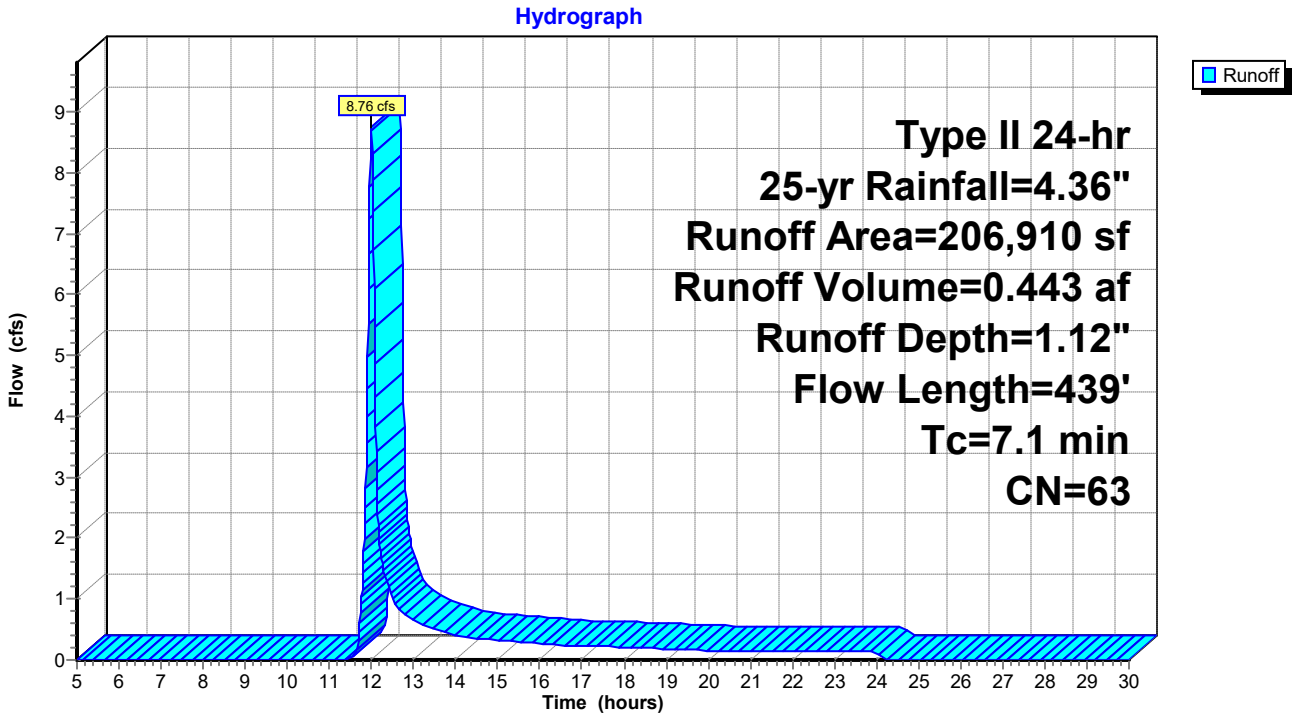
Runoff = 8.76 cfs @ 12.00 hrs, Volume= 0.443 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (sf)	CN	Description
36,765	58	Meadow, non-grazed, HSG B
144,924	60	Woods, Fair, HSG B
25,221	89	Paved roads w/open ditches, 50% imp, HSG B
206,910	63	Weighted Average
194,300		93.91% Pervious Area
12,611		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 33S: DA-1



Hydrograph for Subcatchment 33S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	0.01
12.00	2.89	0.39	**8.75**
12.50	3.20	0.52	1.03
13.00	3.37	0.60	0.65
13.50	3.48	0.65	0.50
14.00	3.58	0.70	0.40
14.50	3.65	0.74	0.36
15.00	3.72	0.77	0.33
15.50	3.78	0.80	0.30
16.00	3.84	0.83	0.26
16.50	3.89	0.86	0.24
17.00	3.93	0.88	0.23
17.50	3.97	0.90	0.22
18.00	4.02	0.93	0.21
18.50	4.05	0.95	0.20
19.00	4.09	0.97	0.18
19.50	4.12	0.98	0.17
20.00	4.15	1.00	0.15
20.50	4.18	1.02	0.15
21.00	4.21	1.03	0.15
21.50	4.23	1.05	0.15
22.00	4.26	1.06	0.14
22.50	4.29	1.08	0.14
23.00	4.31	1.09	0.14
23.50	4.34	1.11	0.14
24.00	**4.36**	**1.12**	0.13
24.50	4.36	1.12	0.00
25.00	4.36	1.12	0.00
25.50	4.36	1.12	0.00
26.00	4.36	1.12	0.00
26.50	4.36	1.12	0.00
27.00	4.36	1.12	0.00
27.50	4.36	1.12	0.00
28.00	4.36	1.12	0.00
28.50	4.36	1.12	0.00
29.00	4.36	1.12	0.00
29.50	4.36	1.12	0.00
30.00	4.36	1.12	0.00

Summary for Subcatchment 34S: DA-1

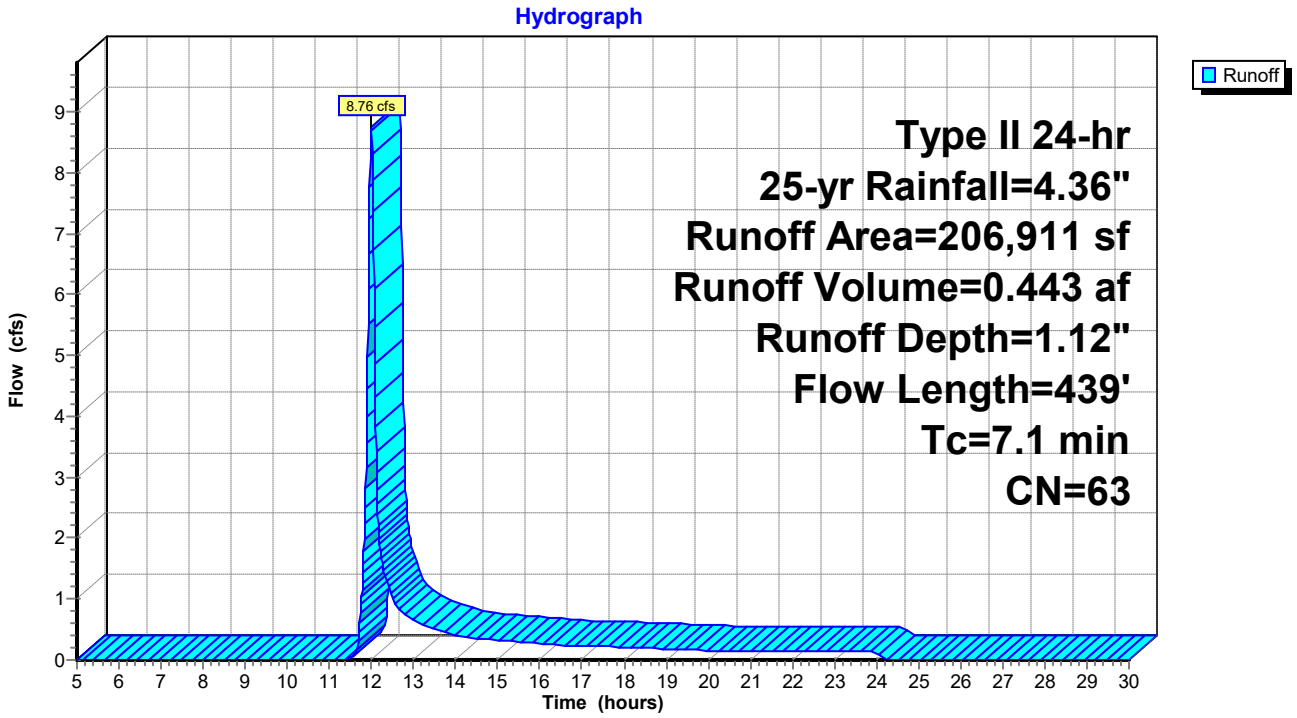
Runoff = 8.76 cfs @ 12.00 hrs, Volume= 0.443 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.36"

Area (sf)	CN	Description
36,785	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
25,207	89	Paved roads w/open ditches, 50% imp, HSG B
206,911	63	Weighted Average
194,308		93.91% Pervious Area
12,604		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 34S: DA-1



Hydrograph for Subcatchment 34S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	0.01
12.00	2.89	0.39	**8.75**
12.50	3.20	0.52	1.03
13.00	3.37	0.60	0.65
13.50	3.48	0.65	0.50
14.00	3.58	0.70	0.40
14.50	3.65	0.74	0.36
15.00	3.72	0.77	0.33
15.50	3.78	0.80	0.30
16.00	3.84	0.83	0.26
16.50	3.89	0.86	0.24
17.00	3.93	0.88	0.23
17.50	3.97	0.90	0.22
18.00	4.02	0.93	0.21
18.50	4.05	0.95	0.20
19.00	4.09	0.97	0.18
19.50	4.12	0.98	0.17
20.00	4.15	1.00	0.15
20.50	4.18	1.02	0.15
21.00	4.21	1.03	0.15
21.50	4.23	1.05	0.15
22.00	4.26	1.06	0.14
22.50	4.29	1.08	0.14
23.00	4.31	1.09	0.14
23.50	4.34	1.11	0.14
24.00	**4.36**	**1.12**	0.13
24.50	4.36	1.12	0.00
25.00	4.36	1.12	0.00
25.50	4.36	1.12	0.00
26.00	4.36	1.12	0.00
26.50	4.36	1.12	0.00
27.00	4.36	1.12	0.00
27.50	4.36	1.12	0.00
28.00	4.36	1.12	0.00
28.50	4.36	1.12	0.00
29.00	4.36	1.12	0.00
29.50	4.36	1.12	0.00
30.00	4.36	1.12	0.00

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area =	4.750 ac,	6.09% Impervious,	Inflow Depth =	1.12"	for 25-yr event
Inflow =	8.76 cfs @	12.00 hrs,	Volume=	0.443 af	
Outflow =	1.14 cfs @	12.44 hrs,	Volume=	0.258 af,	Atten= 87%, Lag= 26.8 min
Primary =	1.14 cfs @	12.44 hrs,	Volume=	0.258 af	

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,689.52' @ 12.44 hrs Surf.Area= 0.142 ac Storage= 0.188 af

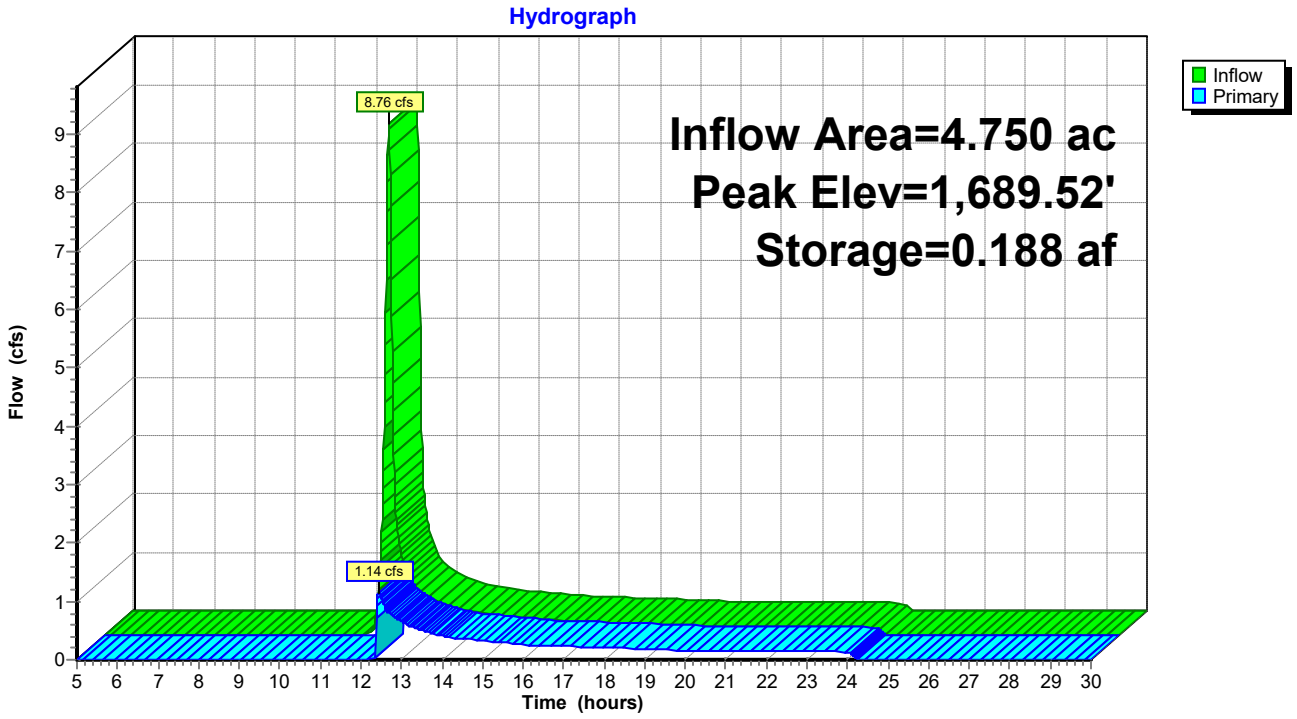
Plug-Flow detention time= 250.4 min calculated for 0.258 af (58% of inflow)
Center-of-Mass det. time= 112.1 min (986.2 - 874.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,688.00'	0.200 af	**20.00'W x 231.00'L x 1.60'H Prismatoid Z=2.0**

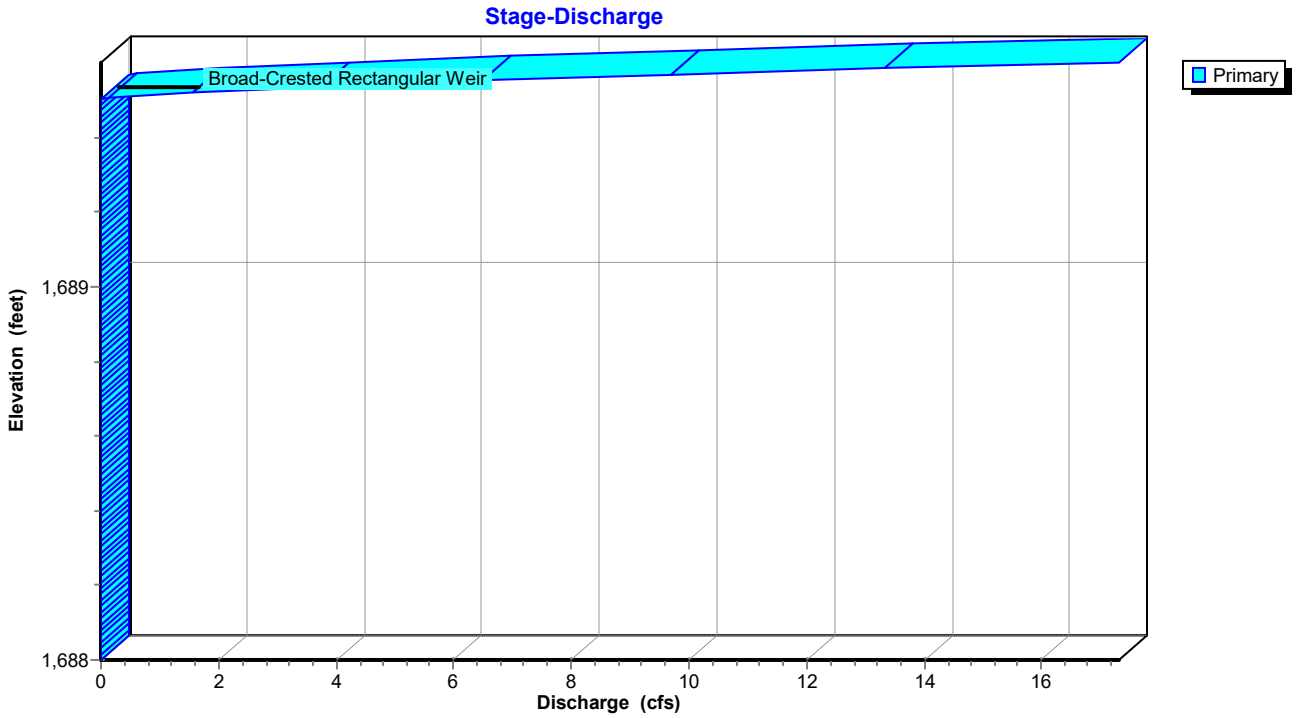
Device	Routing	Invert	Outlet Devices
#1	Primary	1,689.50'	**231.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=1.04 cfs @ 12.44 hrs HW=1,689.52' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 1.04 cfs @ 0.29 fps)

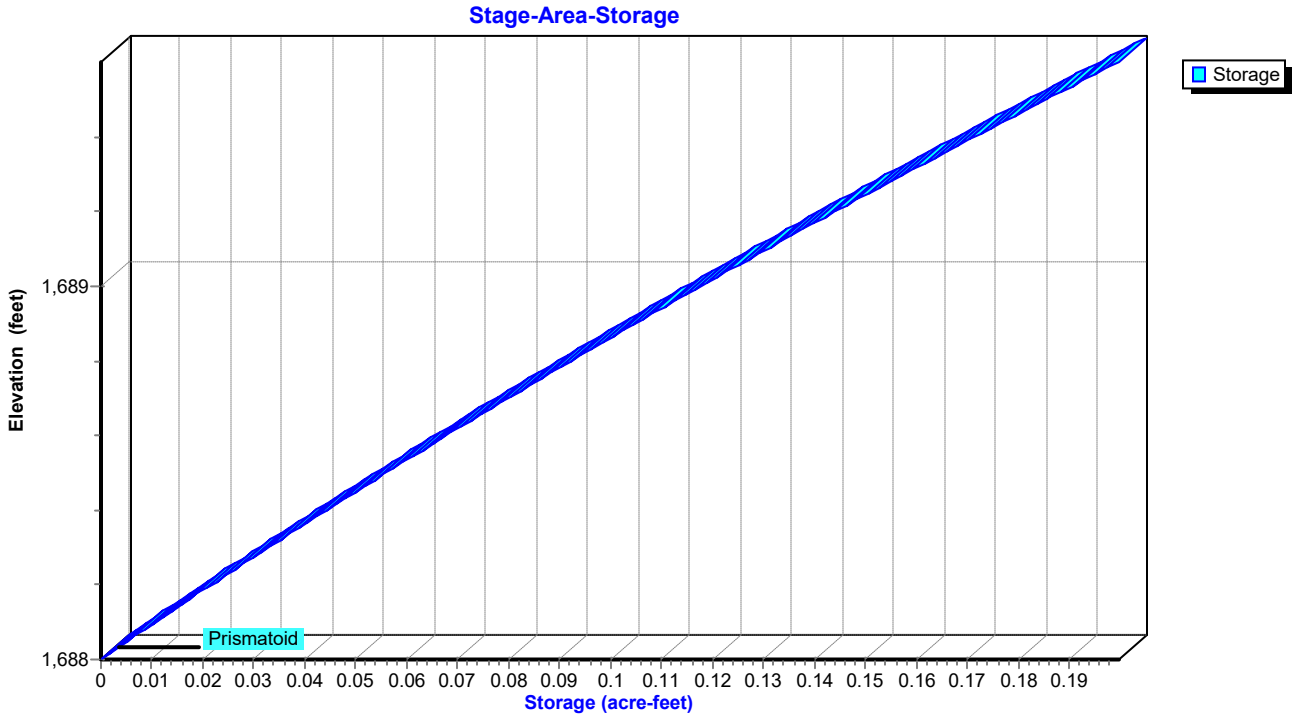
Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0.000	1,688.00	0.00
5.50	0.00	0.000	1,688.00	0.00
6.00	0.00	0.000	1,688.00	0.00
6.50	0.00	0.000	1,688.00	0.00
7.00	0.00	0.000	1,688.00	0.00
7.50	0.00	0.000	1,688.00	0.00
8.00	0.00	0.000	1,688.00	0.00
8.50	0.00	0.000	1,688.00	0.00
9.00	0.00	0.000	1,688.00	0.00
9.50	0.00	0.000	1,688.00	0.00
10.00	0.00	0.000	1,688.00	0.00
10.50	0.00	0.000	1,688.00	0.00
11.00	0.00	0.000	1,688.00	0.00
11.50	0.01	0.000	1,688.00	0.00
12.00	**8.75**	**0.089**	**1,688.77**	**0.00**
12.50	1.03	**0.187**	**1,689.51**	**1.07**
13.00	0.65	0.187	1,689.51	0.66
13.50	0.50	0.187	1,689.51	0.51
14.00	0.40	0.186	1,689.51	0.41
14.50	0.36	0.186	1,689.51	0.36
15.00	0.33	0.186	1,689.51	0.33
15.50	0.30	0.186	1,689.51	0.30
16.00	0.26	0.186	1,689.51	0.26
16.50	0.24	0.186	1,689.51	0.24
17.00	0.23	0.186	1,689.51	0.23
17.50	0.22	0.186	1,689.50	0.22
18.00	0.21	0.186	1,689.50	0.21
18.50	0.20	0.186	1,689.50	0.20
19.00	0.18	0.186	1,689.50	0.18
19.50	0.17	0.186	1,689.50	0.17
20.00	0.15	0.186	1,689.50	0.16
20.50	0.15	0.186	1,689.50	0.15
21.00	0.15	0.186	1,689.50	0.15
21.50	0.15	0.186	1,689.50	0.15
22.00	0.14	0.186	1,689.50	0.14
22.50	0.14	0.186	1,689.50	0.14
23.00	0.14	0.186	1,689.50	0.14
23.50	0.14	0.186	1,689.50	0.14
24.00	0.13	0.186	1,689.50	0.13
24.50	0.00	0.185	1,689.50	0.00
25.00	0.00	0.185	1,689.50	0.00
25.50	0.00	0.185	1,689.50	0.00
26.00	0.00	0.185	1,689.50	0.00
26.50	0.00	0.185	1,689.50	0.00
27.00	0.00	0.185	1,689.50	0.00
27.50	0.00	0.185	1,689.50	0.00
28.00	0.00	0.185	1,689.50	0.00
28.50	0.00	0.185	1,689.50	0.00
29.00	0.00	0.185	1,689.50	0.00
29.50	0.00	0.185	1,689.50	0.00
30.00	0.00	0.185	1,689.50	0.00

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

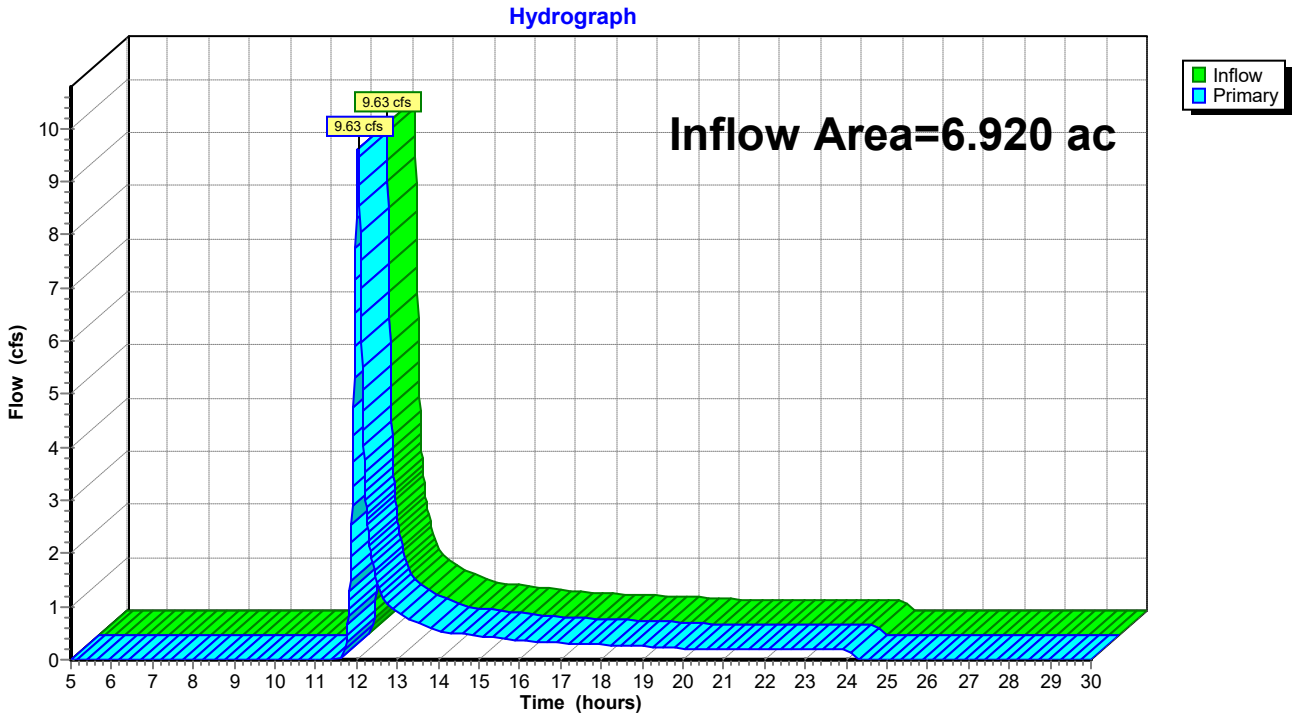
Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,688.00	0.00	1,688.51	0.00	1,689.02	0.00	1,689.53	2.84
1,688.01	0.00	1,688.52	0.00	1,689.03	0.00	1,689.54	4.38
1,688.02	0.00	1,688.53	0.00	1,689.04	0.00	1,689.55	6.12
1,688.03	0.00	1,688.54	0.00	1,689.05	0.00	1,689.56	8.05
1,688.04	0.00	1,688.55	0.00	1,689.06	0.00	1,689.57	10.14
1,688.05	0.00	1,688.56	0.00	1,689.07	0.00	1,689.58	12.39
1,688.06	0.00	1,688.57	0.00	1,689.08	0.00	1,689.59	14.78
1,688.07	0.00	1,688.58	0.00	1,689.09	0.00	1,689.60	**17.31**
1,688.08	0.00	1,688.59	0.00	1,689.10	0.00		
1,688.09	0.00	1,688.60	0.00	1,689.11	0.00		
1,688.10	0.00	1,688.61	0.00	1,689.12	0.00		
1,688.11	0.00	1,688.62	0.00	1,689.13	0.00		
1,688.12	0.00	1,688.63	0.00	1,689.14	0.00		
1,688.13	0.00	1,688.64	0.00	1,689.15	0.00		
1,688.14	0.00	1,688.65	0.00	1,689.16	0.00		
1,688.15	0.00	1,688.66	0.00	1,689.17	0.00		
1,688.16	0.00	1,688.67	0.00	1,689.18	0.00		
1,688.17	0.00	1,688.68	0.00	1,689.19	0.00		
1,688.18	0.00	1,688.69	0.00	1,689.20	0.00		
1,688.19	0.00	1,688.70	0.00	1,689.21	0.00		
1,688.20	0.00	1,688.71	0.00	1,689.22	0.00		
1,688.21	0.00	1,688.72	0.00	1,689.23	0.00		
1,688.22	0.00	1,688.73	0.00	1,689.24	0.00		
1,688.23	0.00	1,688.74	0.00	1,689.25	0.00		
1,688.24	0.00	1,688.75	0.00	1,689.26	0.00		
1,688.25	0.00	1,688.76	0.00	1,689.27	0.00		
1,688.26	0.00	1,688.77	0.00	1,689.28	0.00		
1,688.27	0.00	1,688.78	0.00	1,689.29	0.00		
1,688.28	0.00	1,688.79	0.00	1,689.30	0.00		
1,688.29	0.00	1,688.80	0.00	1,689.31	0.00		
1,688.30	0.00	1,688.81	0.00	1,689.32	0.00		
1,688.31	0.00	1,688.82	0.00	1,689.33	0.00		
1,688.32	0.00	1,688.83	0.00	1,689.34	0.00		
1,688.33	0.00	1,688.84	0.00	1,689.35	0.00		
1,688.34	0.00	1,688.85	0.00	1,689.36	0.00		
1,688.35	0.00	1,688.86	0.00	1,689.37	0.00		
1,688.36	0.00	1,688.87	0.00	1,689.38	0.00		
1,688.37	0.00	1,688.88	0.00	1,689.39	0.00		
1,688.38	0.00	1,688.89	0.00	1,689.40	0.00		
1,688.39	0.00	1,688.90	0.00	1,689.41	0.00		
1,688.40	0.00	1,688.91	0.00	1,689.42	0.00		
1,688.41	0.00	1,688.92	0.00	1,689.43	0.00		
1,688.42	0.00	1,688.93	0.00	1,689.44	0.00		
1,688.43	0.00	1,688.94	0.00	1,689.45	0.00		
1,688.44	0.00	1,688.95	0.00	1,689.46	0.00		
1,688.45	0.00	1,688.96	0.00	1,689.47	0.00		
1,688.46	0.00	1,688.97	0.00	1,689.48	0.00		
1,688.47	0.00	1,688.98	0.00	1,689.49	0.00		
1,688.48	0.00	1,688.99	0.00	1,689.50	0.00		
1,688.49	0.00	1,689.00	0.00	1,689.51	0.55		
1,688.50	0.00	1,689.01	0.00	1,689.52	1.55		

Summary for Link 3L: Pre

Inflow Area = 6.920 ac, 3.63% Impervious, Inflow Depth = 1.00" for 25-yr event
Inflow = 9.63 cfs @ 12.04 hrs, Volume= 0.578 af
Primary = 9.63 cfs @ 12.04 hrs, Volume= 0.578 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 3L: Pre



Hydrograph for Link 3L: Pre

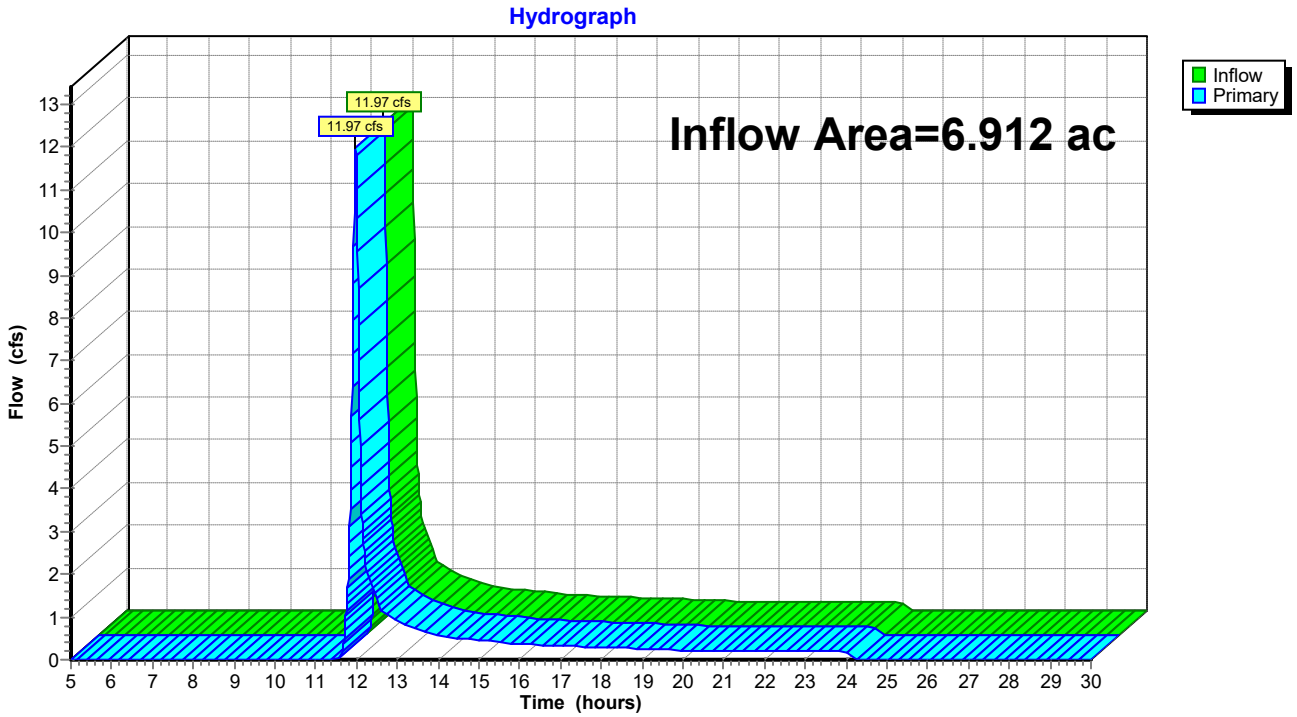
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.00	0.00	0.00
12.00	**8.79**	0.00	**8.79**
12.50	**1.50**	0.00	**1.50**
13.00	0.90	0.00	0.90
13.50	0.69	0.00	0.69
14.00	0.56	0.00	0.56
14.50	0.49	0.00	0.49
15.00	0.45	0.00	0.45
15.50	0.40	0.00	0.40
16.00	0.36	0.00	0.36
16.50	0.33	0.00	0.33
17.00	0.32	0.00	0.32
17.50	0.30	0.00	0.30
18.00	0.28	0.00	0.28
18.50	0.27	0.00	0.27
19.00	0.25	0.00	0.25
19.50	0.23	0.00	0.23
20.00	0.21	0.00	0.21
20.50	0.21	0.00	0.21
21.00	0.20	0.00	0.20
21.50	0.20	0.00	0.20
22.00	0.20	0.00	0.20
22.50	0.19	0.00	0.19
23.00	0.19	0.00	0.19
23.50	0.19	0.00	0.19
24.00	0.18	0.00	0.18
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 6L: Post

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 1.07" for 25-yr event
Inflow = 11.97 cfs @ 11.98 hrs, Volume= 0.614 af
Primary = 11.97 cfs @ 11.98 hrs, Volume= 0.614 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 6L: Post



Hydrograph for Link 6L: Post

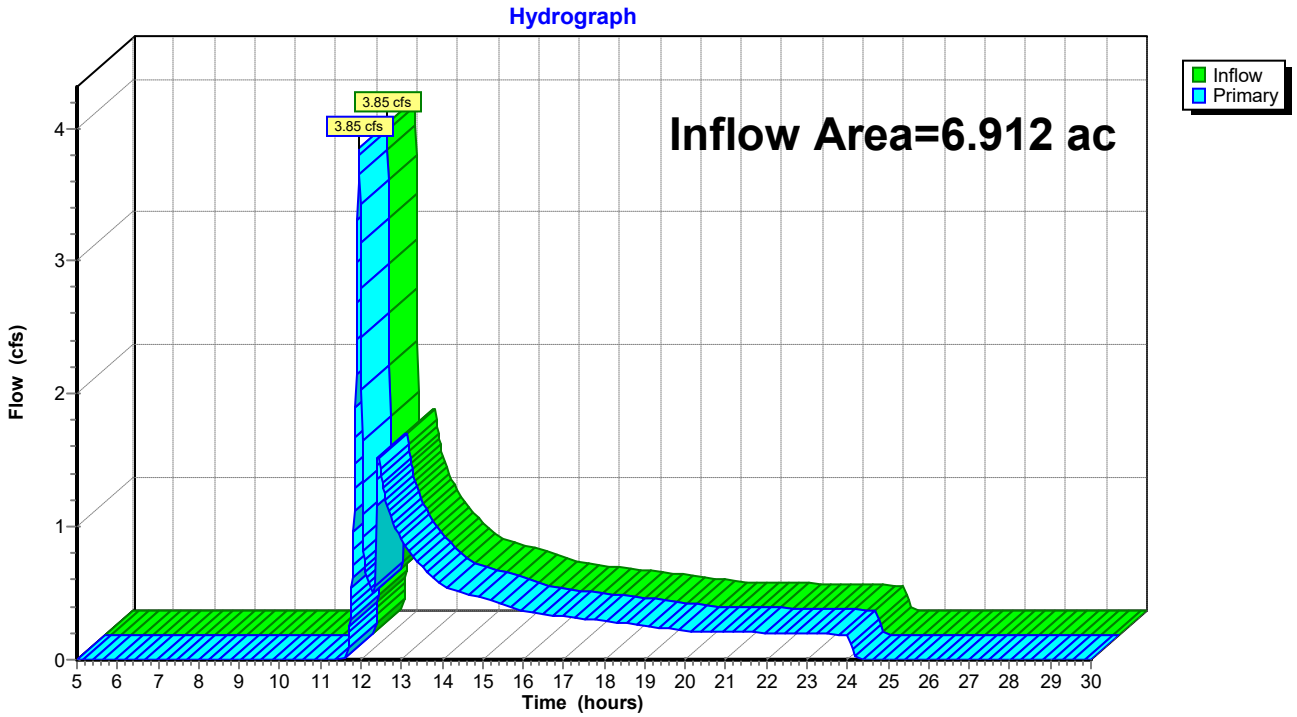
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	**0.01**	0.00	**0.01**
12.00	**11.55**	0.00	**11.55**
12.50	1.39	0.00	1.39
13.00	0.90	0.00	0.90
13.50	0.70	0.00	0.70
14.00	0.56	0.00	0.56
14.50	0.50	0.00	0.50
15.00	0.46	0.00	0.46
15.50	0.41	0.00	0.41
16.00	0.37	0.00	0.37
16.50	0.34	0.00	0.34
17.00	0.33	0.00	0.33
17.50	0.31	0.00	0.31
18.00	0.29	0.00	0.29
18.50	0.27	0.00	0.27
19.00	0.26	0.00	0.26
19.50	0.24	0.00	0.24
20.00	0.22	0.00	0.22
20.50	0.21	0.00	0.21
21.00	0.21	0.00	0.21
21.50	0.21	0.00	0.21
22.00	0.20	0.00	0.20
22.50	0.20	0.00	0.20
23.00	0.20	0.00	0.20
23.50	0.19	0.00	0.19
24.00	0.19	0.00	0.19
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 15L: Post w/BMP

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 0.74" for 25-yr event
Inflow = 3.85 cfs @ 11.95 hrs, Volume= 0.428 af
Primary = 3.85 cfs @ 11.95 hrs, Volume= 0.428 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 15L: Post w/BMP



Hydrograph for Link 15L: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	**0.00**	0.00	**0.00**
12.00	**2.80**	0.00	**2.80**
12.50	1.43	0.00	1.43
13.00	0.91	0.00	0.91
13.50	0.71	0.00	0.71
14.00	0.57	0.00	0.57
14.50	0.51	0.00	0.51
15.00	0.46	0.00	0.46
15.50	0.42	0.00	0.42
16.00	0.37	0.00	0.37
16.50	0.34	0.00	0.34
17.00	0.33	0.00	0.33
17.50	0.31	0.00	0.31
18.00	0.29	0.00	0.29
18.50	0.28	0.00	0.28
19.00	0.26	0.00	0.26
19.50	0.24	0.00	0.24
20.00	0.22	0.00	0.22
20.50	0.21	0.00	0.21
21.00	0.21	0.00	0.21
21.50	0.21	0.00	0.21
22.00	0.20	0.00	0.20
22.50	0.20	0.00	0.20
23.00	0.20	0.00	0.20
23.50	0.19	0.00	0.19
24.00	0.19	0.00	0.19
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Time span=5.00-30.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 27S: DA-1 Runoff Area=301,436 sf 3.63% Impervious Runoff Depth=1.35"
Flow Length=860' Tc=10.4 min CN=61 Runoff=13.44 cfs 0.776 af

Subcatchment 31S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=1.28"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=5.35 cfs 0.230 af

Subcatchment 32S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=1.28"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=5.35 cfs 0.230 af

Subcatchment 33S: DA-1 Runoff Area=206,910 sf 6.09% Impervious Runoff Depth=1.48"
Flow Length=439' Tc=7.1 min CN=63 Runoff=11.85 cfs 0.587 af

Subcatchment 34S: DA-1 Runoff Area=206,911 sf 6.09% Impervious Runoff Depth=1.48"
Flow Length=439' Tc=7.1 min CN=63 Runoff=11.85 cfs 0.587 af

Pond 16P: Infiltration Berm+Amended Peak Elev=1,689.55' Storage=0.192 af Inflow=11.85 cfs 0.587 af
Outflow=5.98 cfs 0.402 af

Link 3L: Pre Inflow=13.44 cfs 0.776 af
Primary=13.44 cfs 0.776 af

Link 6L: Post Inflow=16.35 cfs 0.817 af
Primary=16.35 cfs 0.817 af

Link 15L: Post w/BMP Inflow=6.94 cfs 0.632 af
Primary=6.94 cfs 0.632 af

Total Runoff Area = 20.744 ac Runoff Volume = 2.411 af Average Runoff Depth = 1.39"
96.00% Pervious = 19.914 ac 4.00% Impervious = 0.830 ac

Summary for Subcatchment 27S: DA-1

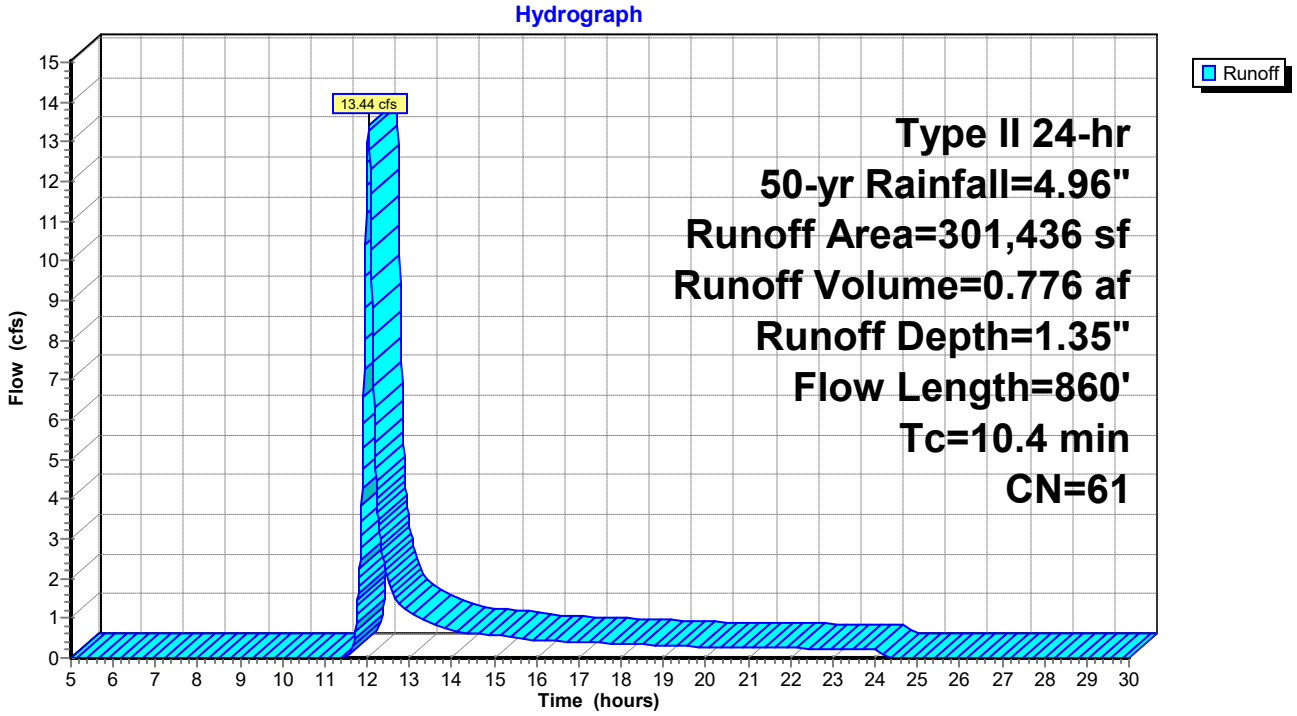
Runoff = 13.44 cfs @ 12.03 hrs, Volume= 0.776 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (sf)	CN	Description
134,617	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
21,900	89	Paved roads w/open ditches, 50% imp, HSG B
301,436	61	Weighted Average
290,486		96.37% Pervious Area
10,950		3.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	860	Total			

Subcatchment 27S: DA-1



Hydrograph for Subcatchment 27S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.31	0.00	0.00
5.50	0.35	0.00	0.00
6.00	0.40	0.00	0.00
6.50	0.44	0.00	0.00
7.00	0.49	0.00	0.00
7.50	0.54	0.00	0.00
8.00	0.60	0.00	0.00
8.50	0.66	0.00	0.00
9.00	0.73	0.00	0.00
9.50	0.81	0.00	0.00
10.00	0.90	0.00	0.00
10.50	1.01	0.00	0.00
11.00	1.17	0.00	0.00
11.50	1.40	0.00	0.05
12.00	3.29	0.48	**12.50**
12.50	3.65	0.64	**1.96**
13.00	3.83	0.73	1.16
13.50	3.96	0.79	0.89
14.00	4.07	0.85	0.71
14.50	4.15	0.89	0.63
15.00	4.23	0.93	0.57
15.50	4.30	0.97	0.51
16.00	4.36	1.00	0.45
16.50	4.42	1.04	0.42
17.00	4.47	1.06	0.40
17.50	4.52	1.09	0.38
18.00	4.57	1.12	0.36
18.50	4.61	1.14	0.34
19.00	4.65	1.16	0.31
19.50	4.69	1.19	0.29
20.00	4.72	1.21	0.27
20.50	4.75	1.22	0.26
21.00	4.79	1.24	0.25
21.50	4.82	1.26	0.25
22.00	4.85	1.28	0.25
22.50	4.88	1.29	0.24
23.00	4.90	1.31	0.24
23.50	4.93	1.33	0.23
24.00	**4.96**	**1.35**	0.23
24.50	4.96	1.35	0.00
25.00	4.96	1.35	0.00
25.50	4.96	1.35	0.00
26.00	4.96	1.35	0.00
26.50	4.96	1.35	0.00
27.00	4.96	1.35	0.00
27.50	4.96	1.35	0.00
28.00	4.96	1.35	0.00
28.50	4.96	1.35	0.00
29.00	4.96	1.35	0.00
29.50	4.96	1.35	0.00
30.00	4.96	1.35	0.00

Summary for Subcatchment 31S: DA-2

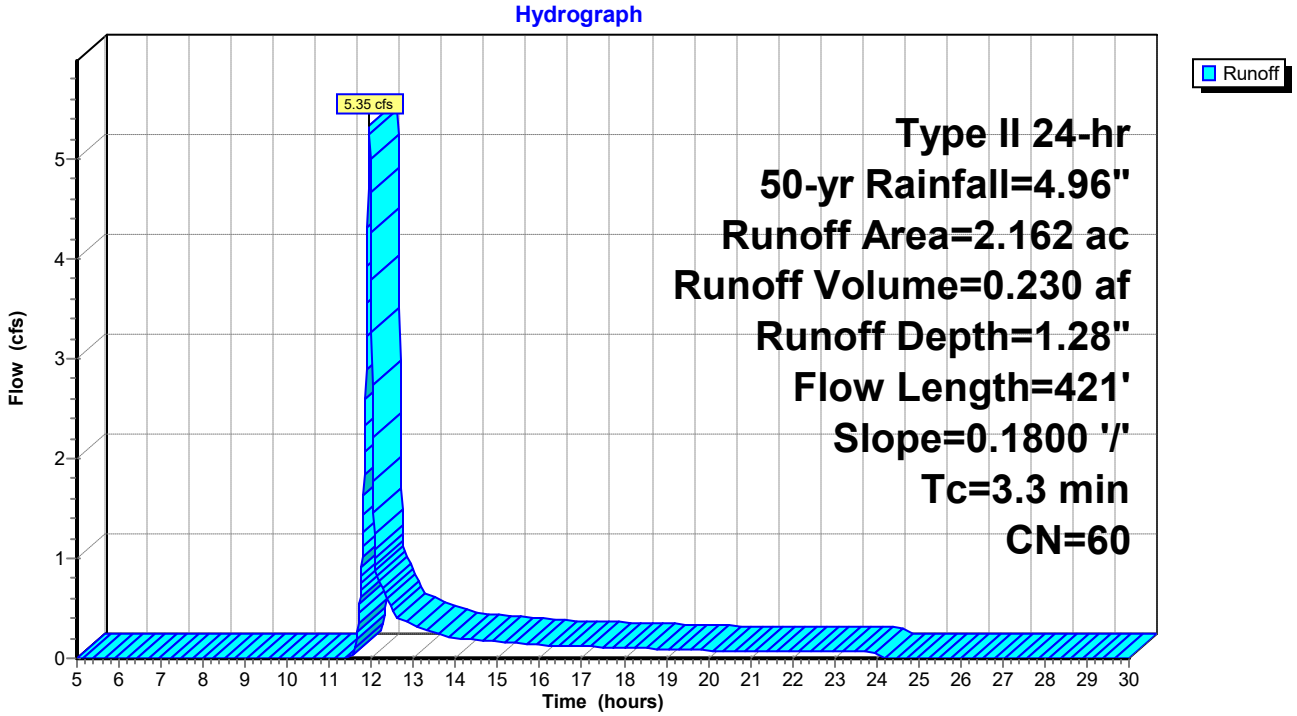
Runoff = 5.35 cfs @ 11.95 hrs, Volume= 0.230 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 31S: DA-2



Hydrograph for Subcatchment 31S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.31	0.00	0.00
5.50	0.35	0.00	0.00
6.00	0.40	0.00	0.00
6.50	0.44	0.00	0.00
7.00	0.49	0.00	0.00
7.50	0.54	0.00	0.00
8.00	0.60	0.00	0.00
8.50	0.66	0.00	0.00
9.00	0.73	0.00	0.00
9.50	0.81	0.00	0.00
10.00	0.90	0.00	0.00
10.50	1.01	0.00	0.00
11.00	1.17	0.00	0.00
11.50	1.40	0.00	**0.02**
12.00	3.29	0.44	**3.79**
12.50	3.65	0.60	0.48
13.00	3.83	0.68	0.32
13.50	3.96	0.74	0.25
14.00	4.07	0.80	0.20
14.50	4.15	0.84	0.19
15.00	4.23	0.88	0.17
15.50	4.30	0.92	0.15
16.00	4.36	0.95	0.13
16.50	4.42	0.98	0.13
17.00	4.47	1.01	0.12
17.50	4.52	1.03	0.11
18.00	4.57	1.06	0.11
18.50	4.61	1.08	0.10
19.00	4.65	1.10	0.09
19.50	4.69	1.12	0.09
20.00	4.72	1.14	0.08
20.50	4.75	1.16	0.08
21.00	4.79	1.18	0.08
21.50	4.82	1.19	0.08
22.00	4.85	1.21	0.07
22.50	4.88	1.23	0.07
23.00	4.90	1.25	0.07
23.50	4.93	1.26	0.07
24.00	**4.96**	**1.28**	0.07
24.50	4.96	1.28	0.00
25.00	4.96	1.28	0.00
25.50	4.96	1.28	0.00
26.00	4.96	1.28	0.00
26.50	4.96	1.28	0.00
27.00	4.96	1.28	0.00
27.50	4.96	1.28	0.00
28.00	4.96	1.28	0.00
28.50	4.96	1.28	0.00
29.00	4.96	1.28	0.00
29.50	4.96	1.28	0.00
30.00	4.96	1.28	0.00

Summary for Subcatchment 32S: DA-2

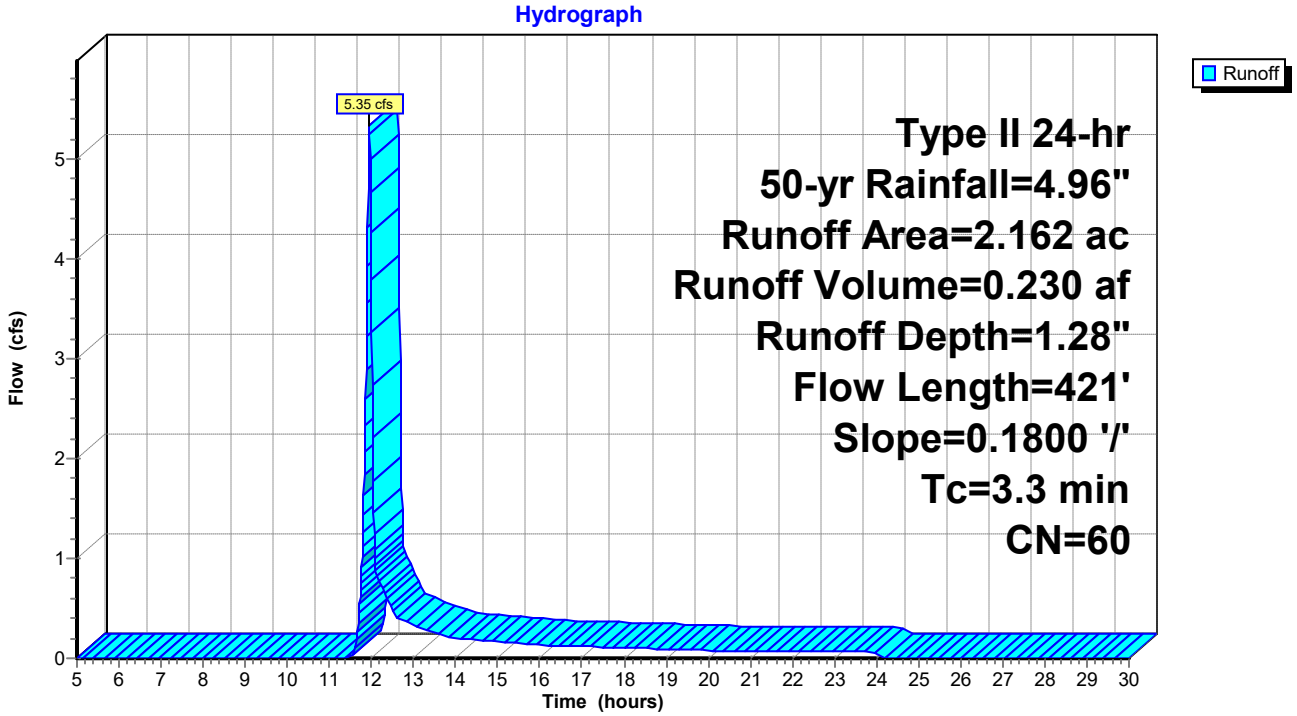
Runoff = 5.35 cfs @ 11.95 hrs, Volume= 0.230 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 32S: DA-2



Hydrograph for Subcatchment 32S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.31	0.00	0.00
5.50	0.35	0.00	0.00
6.00	0.40	0.00	0.00
6.50	0.44	0.00	0.00
7.00	0.49	0.00	0.00
7.50	0.54	0.00	0.00
8.00	0.60	0.00	0.00
8.50	0.66	0.00	0.00
9.00	0.73	0.00	0.00
9.50	0.81	0.00	0.00
10.00	0.90	0.00	0.00
10.50	1.01	0.00	0.00
11.00	1.17	0.00	0.00
11.50	1.40	0.00	**0.02**
12.00	3.29	0.44	**3.79**
12.50	3.65	0.60	0.48
13.00	3.83	0.68	0.32
13.50	3.96	0.74	0.25
14.00	4.07	0.80	0.20
14.50	4.15	0.84	0.19
15.00	4.23	0.88	0.17
15.50	4.30	0.92	0.15
16.00	4.36	0.95	0.13
16.50	4.42	0.98	0.13
17.00	4.47	1.01	0.12
17.50	4.52	1.03	0.11
18.00	4.57	1.06	0.11
18.50	4.61	1.08	0.10
19.00	4.65	1.10	0.09
19.50	4.69	1.12	0.09
20.00	4.72	1.14	0.08
20.50	4.75	1.16	0.08
21.00	4.79	1.18	0.08
21.50	4.82	1.19	0.08
22.00	4.85	1.21	0.07
22.50	4.88	1.23	0.07
23.00	4.90	1.25	0.07
23.50	4.93	1.26	0.07
24.00	**4.96**	**1.28**	0.07
24.50	4.96	1.28	0.00
25.00	4.96	1.28	0.00
25.50	4.96	1.28	0.00
26.00	4.96	1.28	0.00
26.50	4.96	1.28	0.00
27.00	4.96	1.28	0.00
27.50	4.96	1.28	0.00
28.00	4.96	1.28	0.00
28.50	4.96	1.28	0.00
29.00	4.96	1.28	0.00
29.50	4.96	1.28	0.00
30.00	4.96	1.28	0.00

Summary for Subcatchment 33S: DA-1

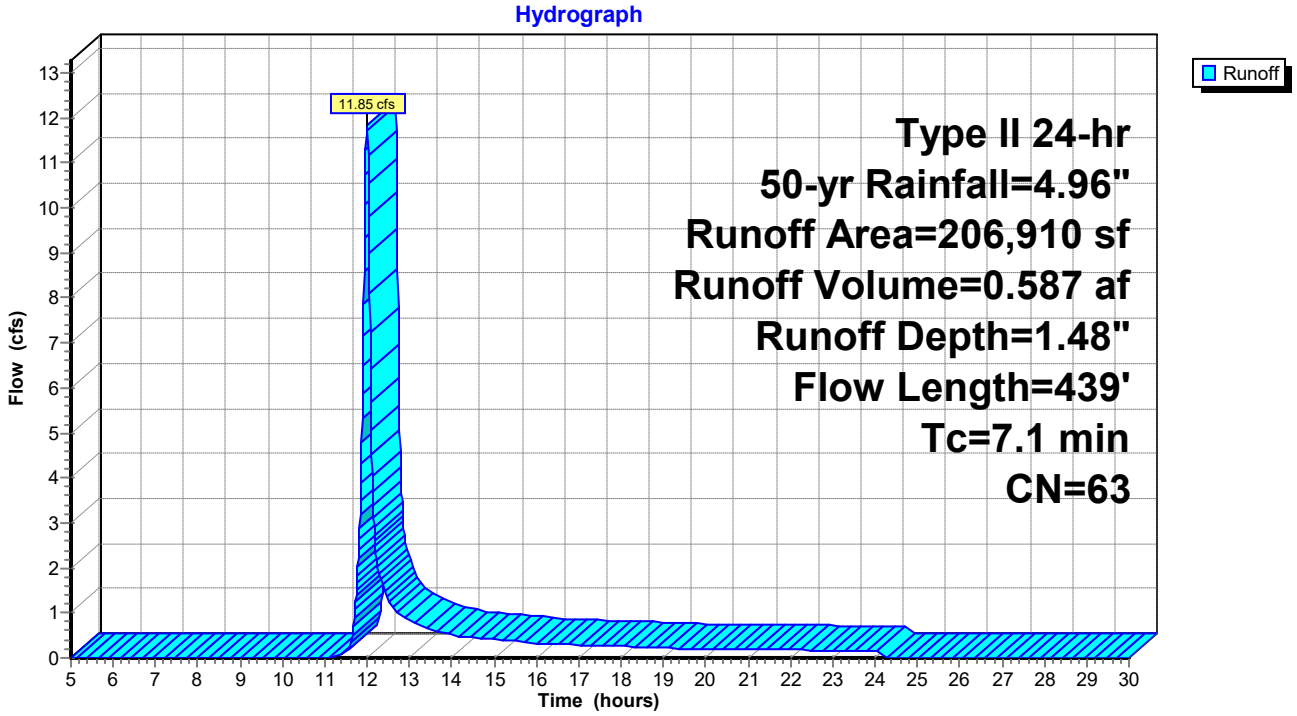
Runoff = 11.85 cfs @ 11.99 hrs, Volume= 0.587 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (sf)	CN	Description
36,765	58	Meadow, non-grazed, HSG B
144,924	60	Woods, Fair, HSG B
25,221	89	Paved roads w/open ditches, 50% imp, HSG B
206,910	63	Weighted Average
194,300		93.91% Pervious Area
12,611		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 33S: DA-1



Hydrograph for Subcatchment 33S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.31	0.00	0.00
5.50	0.35	0.00	0.00
6.00	0.40	0.00	0.00
6.50	0.44	0.00	0.00
7.00	0.49	0.00	0.00
7.50	0.54	0.00	0.00
8.00	0.60	0.00	0.00
8.50	0.66	0.00	0.00
9.00	0.73	0.00	0.00
9.50	0.81	0.00	0.00
10.00	0.90	0.00	0.00
10.50	1.01	0.00	0.00
11.00	1.17	0.00	0.00
11.50	1.40	0.01	**0.14**
12.00	3.29	0.56	**11.82**
12.50	3.65	0.73	1.32
13.00	3.83	0.83	0.83
13.50	3.96	0.90	0.64
14.00	4.07	0.95	0.51
14.50	4.15	1.00	0.45
15.00	4.23	1.05	0.41
15.50	4.30	1.09	0.37
16.00	4.36	1.12	0.33
16.50	4.42	1.16	0.31
17.00	4.47	1.19	0.29
17.50	4.52	1.22	0.28
18.00	4.57	1.24	0.26
18.50	4.61	1.27	0.24
19.00	4.65	1.29	0.23
19.50	4.69	1.32	0.21
20.00	4.72	1.34	0.19
20.50	4.75	1.36	0.19
21.00	4.79	1.37	0.18
21.50	4.82	1.39	0.18
22.00	4.85	1.41	0.18
22.50	4.88	1.43	0.17
23.00	4.90	1.45	0.17
23.50	4.93	1.47	0.17
24.00	**4.96**	**1.48**	0.17
24.50	4.96	1.48	0.00
25.00	4.96	1.48	0.00
25.50	4.96	1.48	0.00
26.00	4.96	1.48	0.00
26.50	4.96	1.48	0.00
27.00	4.96	1.48	0.00
27.50	4.96	1.48	0.00
28.00	4.96	1.48	0.00
28.50	4.96	1.48	0.00
29.00	4.96	1.48	0.00
29.50	4.96	1.48	0.00
30.00	4.96	1.48	0.00

Summary for Subcatchment 34S: DA-1

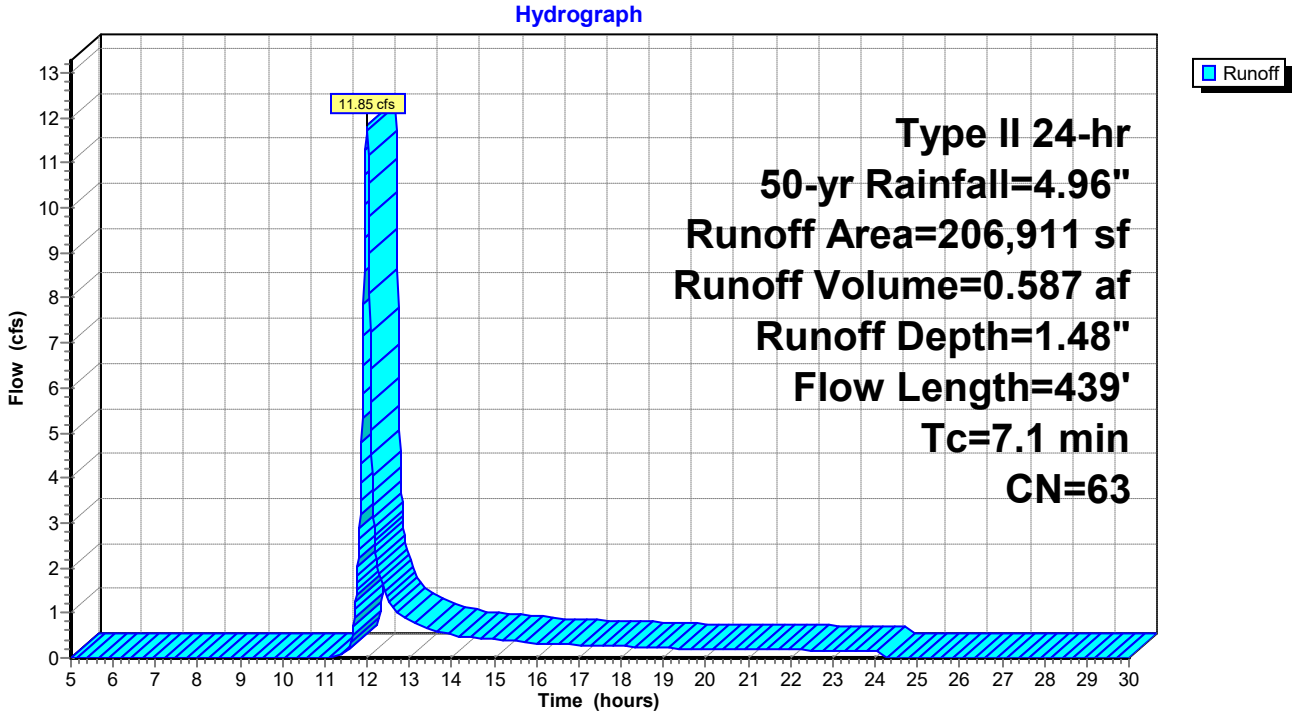
Runoff = 11.85 cfs @ 11.99 hrs, Volume= 0.587 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.96"

Area (sf)	CN	Description
36,785	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
25,207	89	Paved roads w/open ditches, 50% imp, HSG B
206,911	63	Weighted Average
194,308		93.91% Pervious Area
12,604		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 34S: DA-1



Hydrograph for Subcatchment 34S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.31	0.00	0.00
5.50	0.35	0.00	0.00
6.00	0.40	0.00	0.00
6.50	0.44	0.00	0.00
7.00	0.49	0.00	0.00
7.50	0.54	0.00	0.00
8.00	0.60	0.00	0.00
8.50	0.66	0.00	0.00
9.00	0.73	0.00	0.00
9.50	0.81	0.00	0.00
10.00	0.90	0.00	0.00
10.50	1.01	0.00	0.00
11.00	1.17	0.00	0.00
11.50	1.40	0.01	**0.14**
12.00	3.29	0.56	**11.82**
12.50	3.65	0.73	1.32
13.00	3.83	0.83	0.83
13.50	3.96	0.90	0.64
14.00	4.07	0.95	0.51
14.50	4.15	1.00	0.45
15.00	4.23	1.05	0.41
15.50	4.30	1.09	0.37
16.00	4.36	1.12	0.33
16.50	4.42	1.16	0.31
17.00	4.47	1.19	0.29
17.50	4.52	1.22	0.28
18.00	4.57	1.24	0.26
18.50	4.61	1.27	0.24
19.00	4.65	1.29	0.23
19.50	4.69	1.32	0.21
20.00	4.72	1.34	0.19
20.50	4.75	1.36	0.19
21.00	4.79	1.37	0.18
21.50	4.82	1.39	0.18
22.00	4.85	1.41	0.18
22.50	4.88	1.43	0.17
23.00	4.90	1.45	0.17
23.50	4.93	1.47	0.17
24.00	**4.96**	**1.48**	0.17
24.50	4.96	1.48	0.00
25.00	4.96	1.48	0.00
25.50	4.96	1.48	0.00
26.00	4.96	1.48	0.00
26.50	4.96	1.48	0.00
27.00	4.96	1.48	0.00
27.50	4.96	1.48	0.00
28.00	4.96	1.48	0.00
28.50	4.96	1.48	0.00
29.00	4.96	1.48	0.00
29.50	4.96	1.48	0.00
30.00	4.96	1.48	0.00

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area =	4.750 ac,	6.09% Impervious,	Inflow Depth =	1.48"	for 50-yr event
Inflow =	11.85 cfs @	11.99 hrs,	Volume=	0.587 af	
Outflow =	5.98 cfs @	12.09 hrs,	Volume=	0.402 af,	Atten= 50%, Lag= 5.6 min
Primary =	5.98 cfs @	12.09 hrs,	Volume=	0.402 af	

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,689.55' @ 12.09 hrs Surf.Area= 0.143 ac Storage= 0.192 af

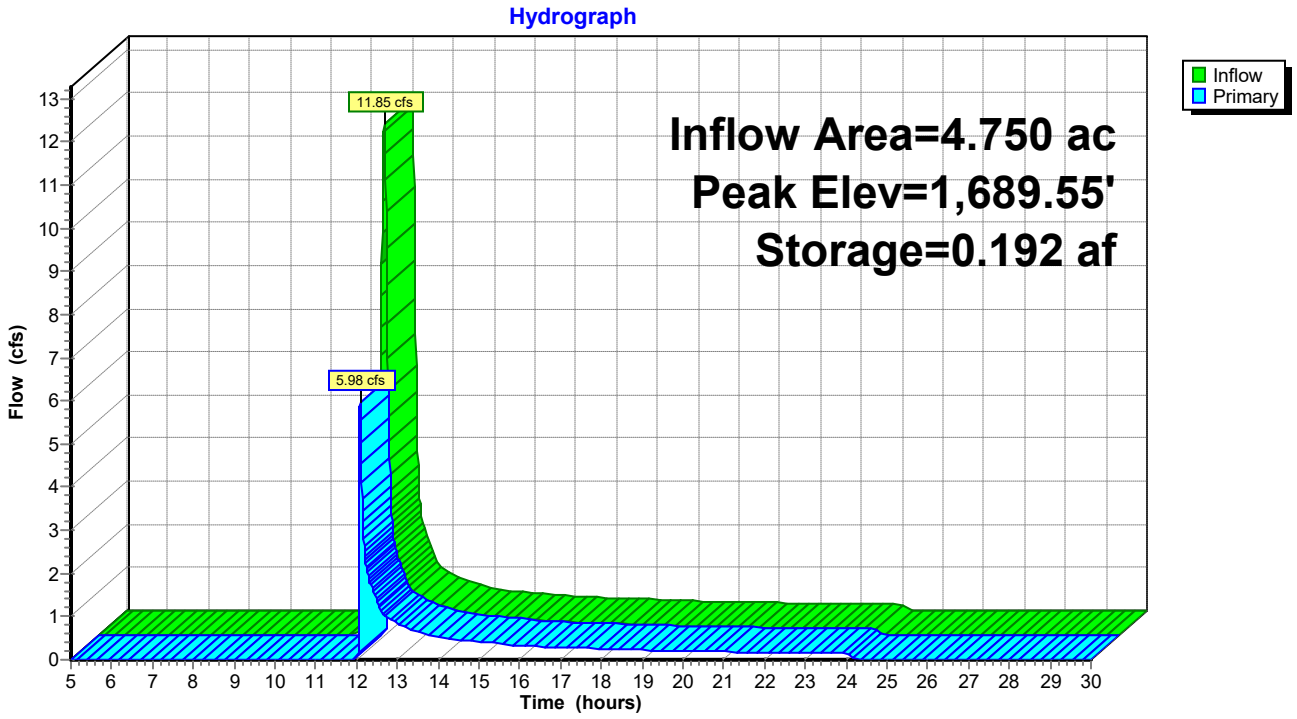
Plug-Flow detention time= 188.2 min calculated for 0.402 af (68% of inflow)
Center-of-Mass det. time= 70.6 min (935.3 - 864.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,688.00'	0.200 af	**20.00'W x 231.00'L x 1.60'H Prismatoid Z=2.0**

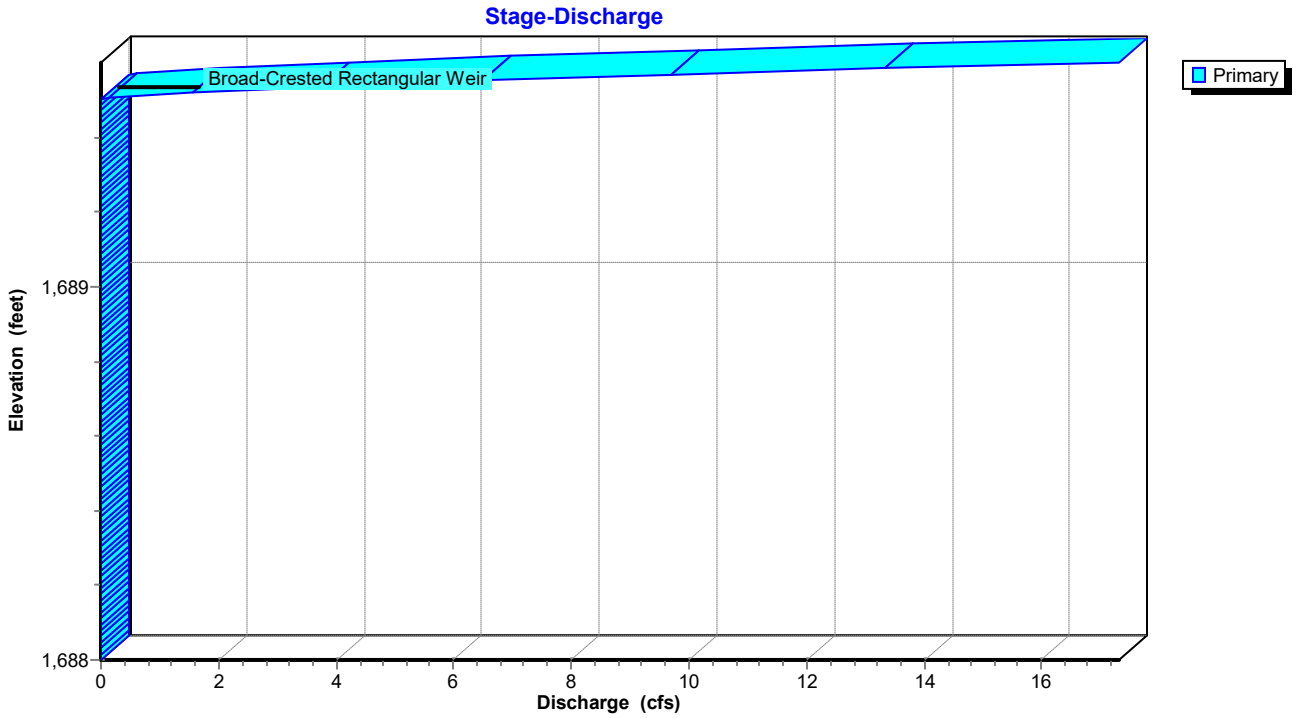
Device	Routing	Invert	Outlet Devices
#1	Primary	1,689.50'	**231.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=5.89 cfs @ 12.09 hrs HW=1,689.55' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 5.89 cfs @ 0.52 fps)

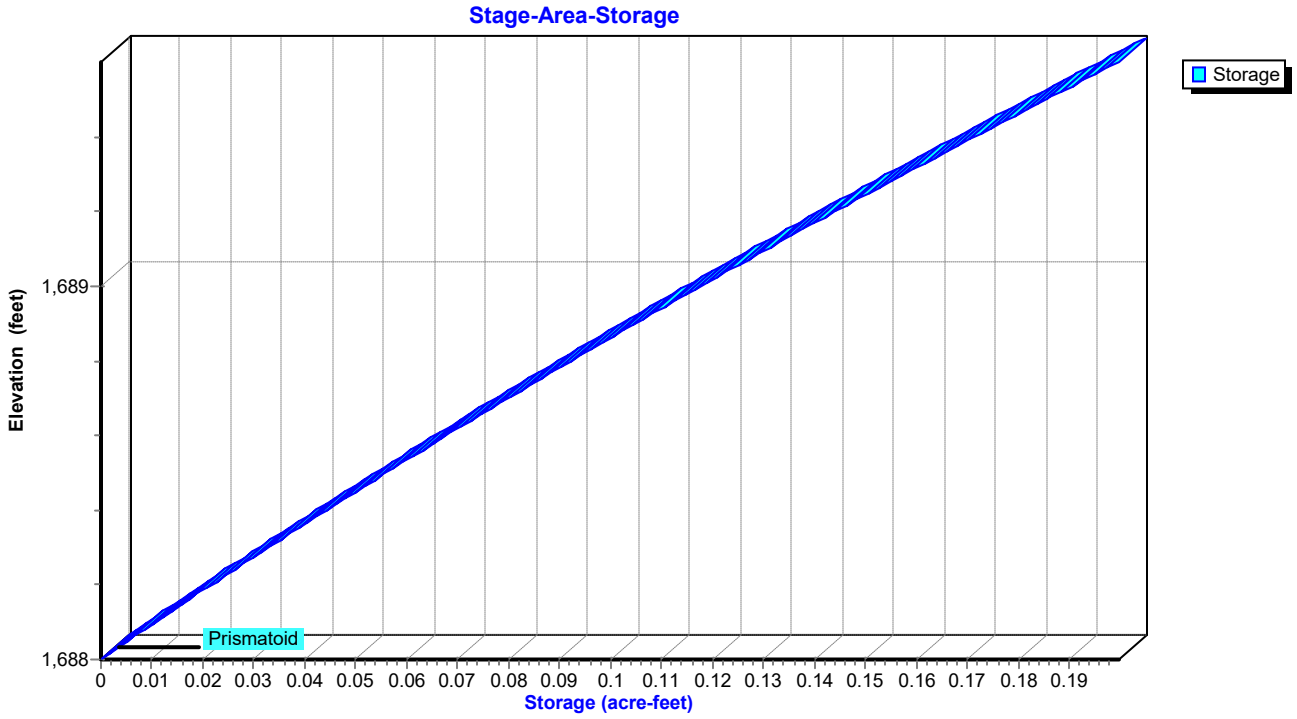
Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0.000	1,688.00	0.00
5.50	0.00	0.000	1,688.00	0.00
6.00	0.00	0.000	1,688.00	0.00
6.50	0.00	0.000	1,688.00	0.00
7.00	0.00	0.000	1,688.00	0.00
7.50	0.00	0.000	1,688.00	0.00
8.00	0.00	0.000	1,688.00	0.00
8.50	0.00	0.000	1,688.00	0.00
9.00	0.00	0.000	1,688.00	0.00
9.50	0.00	0.000	1,688.00	0.00
10.00	0.00	0.000	1,688.00	0.00
10.50	0.00	0.000	1,688.00	0.00
11.00	0.00	0.000	1,688.00	0.00
11.50	**0.14**	0.002	1,688.02	0.00
12.00	**11.82**	**0.136**	**1,689.14**	**0.00**
12.50	1.32	**0.188**	**1,689.52**	**1.37**
13.00	0.83	0.187	1,689.51	0.84
13.50	0.64	0.187	1,689.51	0.65
14.00	0.51	0.187	1,689.51	0.52
14.50	0.45	0.187	1,689.51	0.46
15.00	0.41	0.186	1,689.51	0.42
15.50	0.37	0.186	1,689.51	0.37
16.00	0.33	0.186	1,689.51	0.33
16.50	0.31	0.186	1,689.51	0.31
17.00	0.29	0.186	1,689.51	0.29
17.50	0.28	0.186	1,689.51	0.28
18.00	0.26	0.186	1,689.51	0.26
18.50	0.24	0.186	1,689.51	0.24
19.00	0.23	0.186	1,689.51	0.23
19.50	0.21	0.186	1,689.50	0.21
20.00	0.19	0.186	1,689.50	0.19
20.50	0.19	0.186	1,689.50	0.19
21.00	0.18	0.186	1,689.50	0.18
21.50	0.18	0.186	1,689.50	0.18
22.00	0.18	0.186	1,689.50	0.18
22.50	0.17	0.186	1,689.50	0.17
23.00	0.17	0.186	1,689.50	0.17
23.50	0.17	0.186	1,689.50	0.17
24.00	0.17	0.186	1,689.50	0.17
24.50	0.00	0.185	1,689.50	0.00
25.00	0.00	0.185	1,689.50	0.00
25.50	0.00	0.185	1,689.50	0.00
26.00	0.00	0.185	1,689.50	0.00
26.50	0.00	0.185	1,689.50	0.00
27.00	0.00	0.185	1,689.50	0.00
27.50	0.00	0.185	1,689.50	0.00
28.00	0.00	0.185	1,689.50	0.00
28.50	0.00	0.185	1,689.50	0.00
29.00	0.00	0.185	1,689.50	0.00
29.50	0.00	0.185	1,689.50	0.00
30.00	0.00	0.185	1,689.50	0.00

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

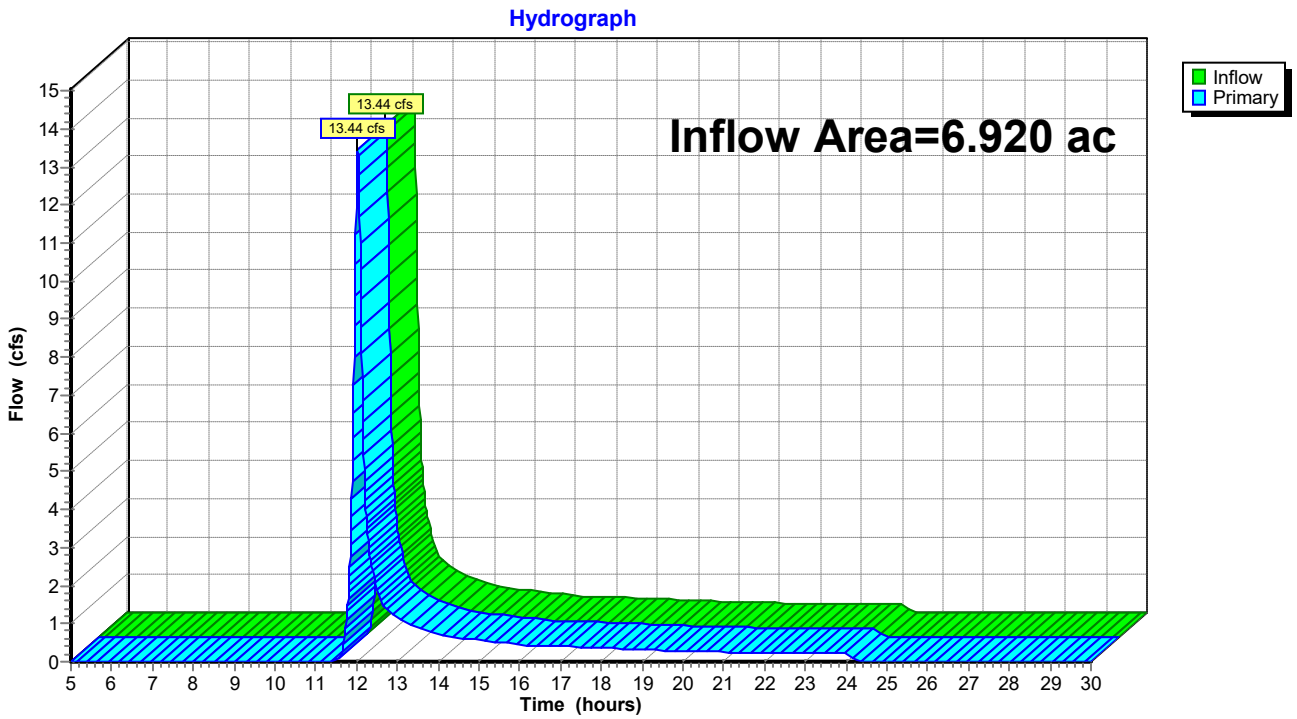
Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,688.00	0.00	1,688.51	0.00	1,689.02	0.00	1,689.53	2.84
1,688.01	0.00	1,688.52	0.00	1,689.03	0.00	1,689.54	4.38
1,688.02	0.00	1,688.53	0.00	1,689.04	0.00	1,689.55	6.12
1,688.03	0.00	1,688.54	0.00	1,689.05	0.00	1,689.56	8.05
1,688.04	0.00	1,688.55	0.00	1,689.06	0.00	1,689.57	10.14
1,688.05	0.00	1,688.56	0.00	1,689.07	0.00	1,689.58	12.39
1,688.06	0.00	1,688.57	0.00	1,689.08	0.00	1,689.59	14.78
1,688.07	0.00	1,688.58	0.00	1,689.09	0.00	1,689.60	**17.31**
1,688.08	0.00	1,688.59	0.00	1,689.10	0.00		
1,688.09	0.00	1,688.60	0.00	1,689.11	0.00		
1,688.10	0.00	1,688.61	0.00	1,689.12	0.00		
1,688.11	0.00	1,688.62	0.00	1,689.13	0.00		
1,688.12	0.00	1,688.63	0.00	1,689.14	0.00		
1,688.13	0.00	1,688.64	0.00	1,689.15	0.00		
1,688.14	0.00	1,688.65	0.00	1,689.16	0.00		
1,688.15	0.00	1,688.66	0.00	1,689.17	0.00		
1,688.16	0.00	1,688.67	0.00	1,689.18	0.00		
1,688.17	0.00	1,688.68	0.00	1,689.19	0.00		
1,688.18	0.00	1,688.69	0.00	1,689.20	0.00		
1,688.19	0.00	1,688.70	0.00	1,689.21	0.00		
1,688.20	0.00	1,688.71	0.00	1,689.22	0.00		
1,688.21	0.00	1,688.72	0.00	1,689.23	0.00		
1,688.22	0.00	1,688.73	0.00	1,689.24	0.00		
1,688.23	0.00	1,688.74	0.00	1,689.25	0.00		
1,688.24	0.00	1,688.75	0.00	1,689.26	0.00		
1,688.25	0.00	1,688.76	0.00	1,689.27	0.00		
1,688.26	0.00	1,688.77	0.00	1,689.28	0.00		
1,688.27	0.00	1,688.78	0.00	1,689.29	0.00		
1,688.28	0.00	1,688.79	0.00	1,689.30	0.00		
1,688.29	0.00	1,688.80	0.00	1,689.31	0.00		
1,688.30	0.00	1,688.81	0.00	1,689.32	0.00		
1,688.31	0.00	1,688.82	0.00	1,689.33	0.00		
1,688.32	0.00	1,688.83	0.00	1,689.34	0.00		
1,688.33	0.00	1,688.84	0.00	1,689.35	0.00		
1,688.34	0.00	1,688.85	0.00	1,689.36	0.00		
1,688.35	0.00	1,688.86	0.00	1,689.37	0.00		
1,688.36	0.00	1,688.87	0.00	1,689.38	0.00		
1,688.37	0.00	1,688.88	0.00	1,689.39	0.00		
1,688.38	0.00	1,688.89	0.00	1,689.40	0.00		
1,688.39	0.00	1,688.90	0.00	1,689.41	0.00		
1,688.40	0.00	1,688.91	0.00	1,689.42	0.00		
1,688.41	0.00	1,688.92	0.00	1,689.43	0.00		
1,688.42	0.00	1,688.93	0.00	1,689.44	0.00		
1,688.43	0.00	1,688.94	0.00	1,689.45	0.00		
1,688.44	0.00	1,688.95	0.00	1,689.46	0.00		
1,688.45	0.00	1,688.96	0.00	1,689.47	0.00		
1,688.46	0.00	1,688.97	0.00	1,689.48	0.00		
1,688.47	0.00	1,688.98	0.00	1,689.49	0.00		
1,688.48	0.00	1,688.99	0.00	1,689.50	0.00		
1,688.49	0.00	1,689.00	0.00	1,689.51	0.55		
1,688.50	0.00	1,689.01	0.00	1,689.52	1.55		

Summary for Link 3L: Pre

Inflow Area = 6.920 ac, 3.63% Impervious, Inflow Depth = 1.35" for 50-yr event
Inflow = 13.44 cfs @ 12.03 hrs, Volume= 0.776 af
Primary = 13.44 cfs @ 12.03 hrs, Volume= 0.776 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 3L: Pre



Hydrograph for Link 3L: Pre

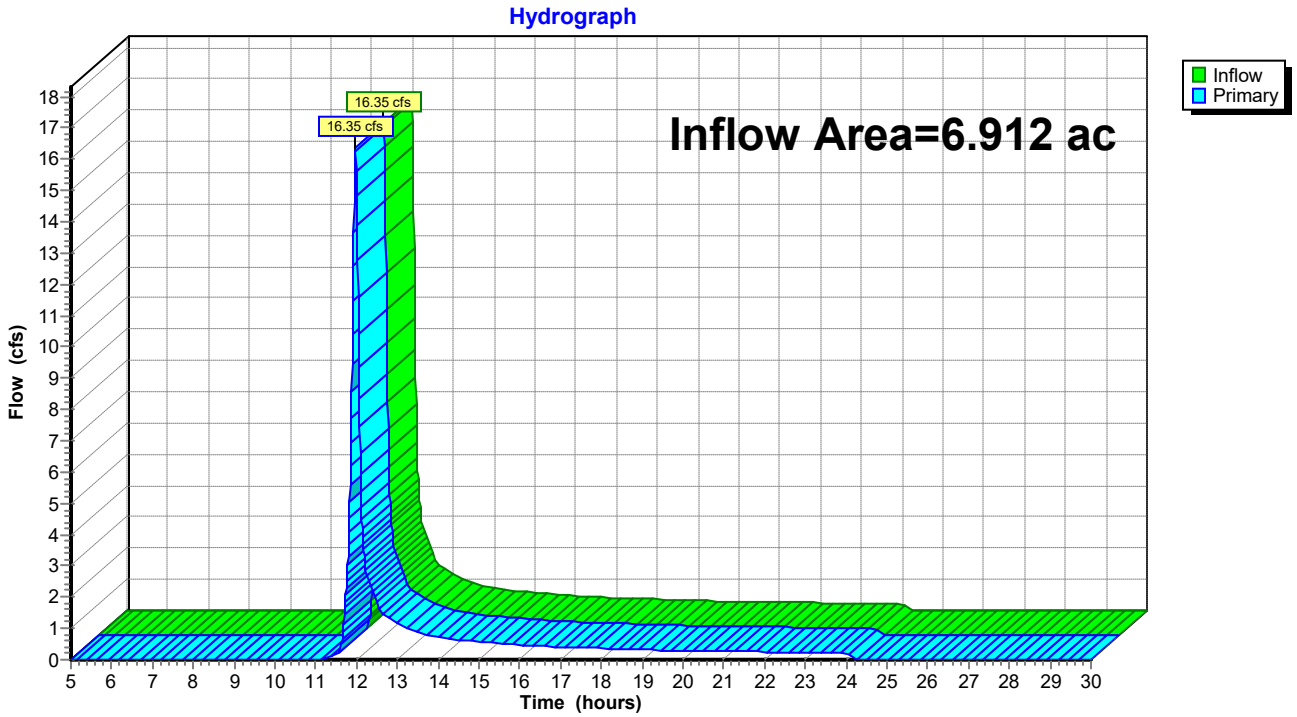
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.05	0.00	0.05
12.00	**12.50**	0.00	**12.50**
12.50	**1.96**	0.00	**1.96**
13.00	1.16	0.00	1.16
13.50	0.89	0.00	0.89
14.00	0.71	0.00	0.71
14.50	0.63	0.00	0.63
15.00	0.57	0.00	0.57
15.50	0.51	0.00	0.51
16.00	0.45	0.00	0.45
16.50	0.42	0.00	0.42
17.00	0.40	0.00	0.40
17.50	0.38	0.00	0.38
18.00	0.36	0.00	0.36
18.50	0.34	0.00	0.34
19.00	0.31	0.00	0.31
19.50	0.29	0.00	0.29
20.00	0.27	0.00	0.27
20.50	0.26	0.00	0.26
21.00	0.25	0.00	0.25
21.50	0.25	0.00	0.25
22.00	0.25	0.00	0.25
22.50	0.24	0.00	0.24
23.00	0.24	0.00	0.24
23.50	0.23	0.00	0.23
24.00	0.23	0.00	0.23
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 6L: Post

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 1.42" for 50-yr event
Inflow = 16.35 cfs @ 11.98 hrs, Volume= 0.817 af
Primary = 16.35 cfs @ 11.98 hrs, Volume= 0.817 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 6L: Post



Hydrograph for Link 6L: Post

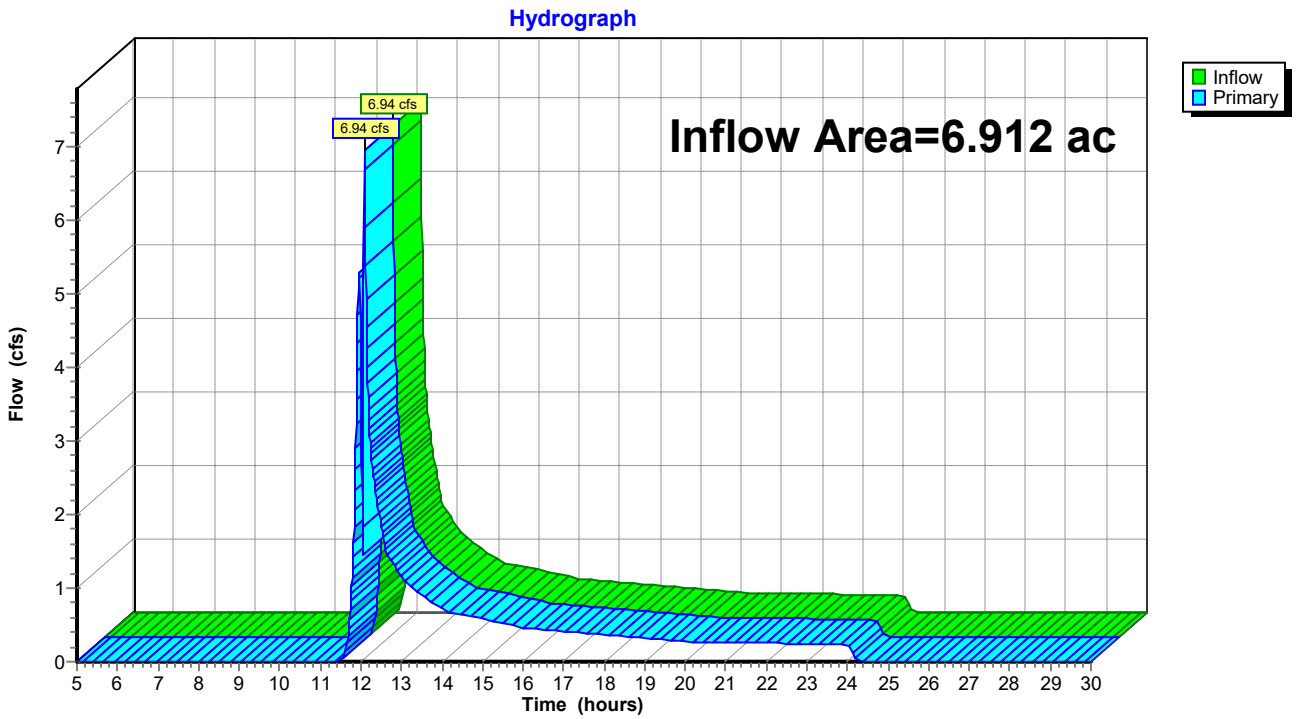
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	**0.16**	0.00	**0.16**
12.00	**15.61**	0.00	**15.61**
12.50	1.80	0.00	1.80
13.00	1.15	0.00	1.15
13.50	0.89	0.00	0.89
14.00	0.72	0.00	0.72
14.50	0.64	0.00	0.64
15.00	0.58	0.00	0.58
15.50	0.52	0.00	0.52
16.00	0.46	0.00	0.46
16.50	0.43	0.00	0.43
17.00	0.41	0.00	0.41
17.50	0.39	0.00	0.39
18.00	0.37	0.00	0.37
18.50	0.34	0.00	0.34
19.00	0.32	0.00	0.32
19.50	0.30	0.00	0.30
20.00	0.27	0.00	0.27
20.50	0.26	0.00	0.26
21.00	0.26	0.00	0.26
21.50	0.26	0.00	0.26
22.00	0.25	0.00	0.25
22.50	0.25	0.00	0.25
23.00	0.24	0.00	0.24
23.50	0.24	0.00	0.24
24.00	0.23	0.00	0.23
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 15L: Post w/BMP

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 1.10" for 50-yr event
Inflow = 6.94 cfs @ 12.09 hrs, Volume= 0.632 af
Primary = 6.94 cfs @ 12.09 hrs, Volume= 0.632 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 15L: Post w/BMP



Hydrograph for Link 15L: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.02	0.00	0.02
12.00	**3.79**	0.00	**3.79**
12.50	**1.85**	0.00	**1.85**
13.00	1.16	0.00	1.16
13.50	0.90	0.00	0.90
14.00	0.72	0.00	0.72
14.50	0.64	0.00	0.64
15.00	0.58	0.00	0.58
15.50	0.52	0.00	0.52
16.00	0.46	0.00	0.46
16.50	0.43	0.00	0.43
17.00	0.41	0.00	0.41
17.50	0.39	0.00	0.39
18.00	0.37	0.00	0.37
18.50	0.34	0.00	0.34
19.00	0.32	0.00	0.32
19.50	0.30	0.00	0.30
20.00	0.27	0.00	0.27
20.50	0.26	0.00	0.26
21.00	0.26	0.00	0.26
21.50	0.26	0.00	0.26
22.00	0.25	0.00	0.25
22.50	0.25	0.00	0.25
23.00	0.24	0.00	0.24
23.50	0.24	0.00	0.24
24.00	0.23	0.00	0.23
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Time span=5.00-30.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 27S: DA-1 Runoff Area=301,436 sf 3.63% Impervious Runoff Depth=1.75"
Flow Length=860' Tc=10.4 min CN=61 Runoff=17.88 cfs 1.009 af

Subcatchment 31S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=1.67"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=7.10 cfs 0.301 af

Subcatchment 32S: DA-2 Runoff Area=2.162 ac 0.00% Impervious Runoff Depth=1.67"
Flow Length=421' Slope=0.1800 '/' Tc=3.3 min CN=60 Runoff=7.10 cfs 0.301 af

Subcatchment 33S: DA-1 Runoff Area=206,910 sf 6.09% Impervious Runoff Depth=1.91"
Flow Length=439' Tc=7.1 min CN=63 Runoff=15.43 cfs 0.755 af

Subcatchment 34S: DA-1 Runoff Area=206,911 sf 6.09% Impervious Runoff Depth=1.91"
Flow Length=439' Tc=7.1 min CN=63 Runoff=15.43 cfs 0.755 af

Pond 16P: Infiltration Berm+Amended Peak Elev=1,689.59' Storage=0.198 af Inflow=15.43 cfs 0.755 af
Outflow=14.28 cfs 0.570 af

Link 3L: Pre Inflow=17.88 cfs 1.009 af
Primary=17.88 cfs 1.009 af

Link 6L: Post Inflow=21.44 cfs 1.057 af
Primary=21.44 cfs 1.057 af

Link 15L: Post w/BMP Inflow=17.68 cfs 0.871 af
Primary=17.68 cfs 0.871 af

Total Runoff Area = 20.744 ac Runoff Volume = 3.122 af Average Runoff Depth = 1.81"
96.00% Pervious = 19.914 ac 4.00% Impervious = 0.830 ac

Summary for Subcatchment 27S: DA-1

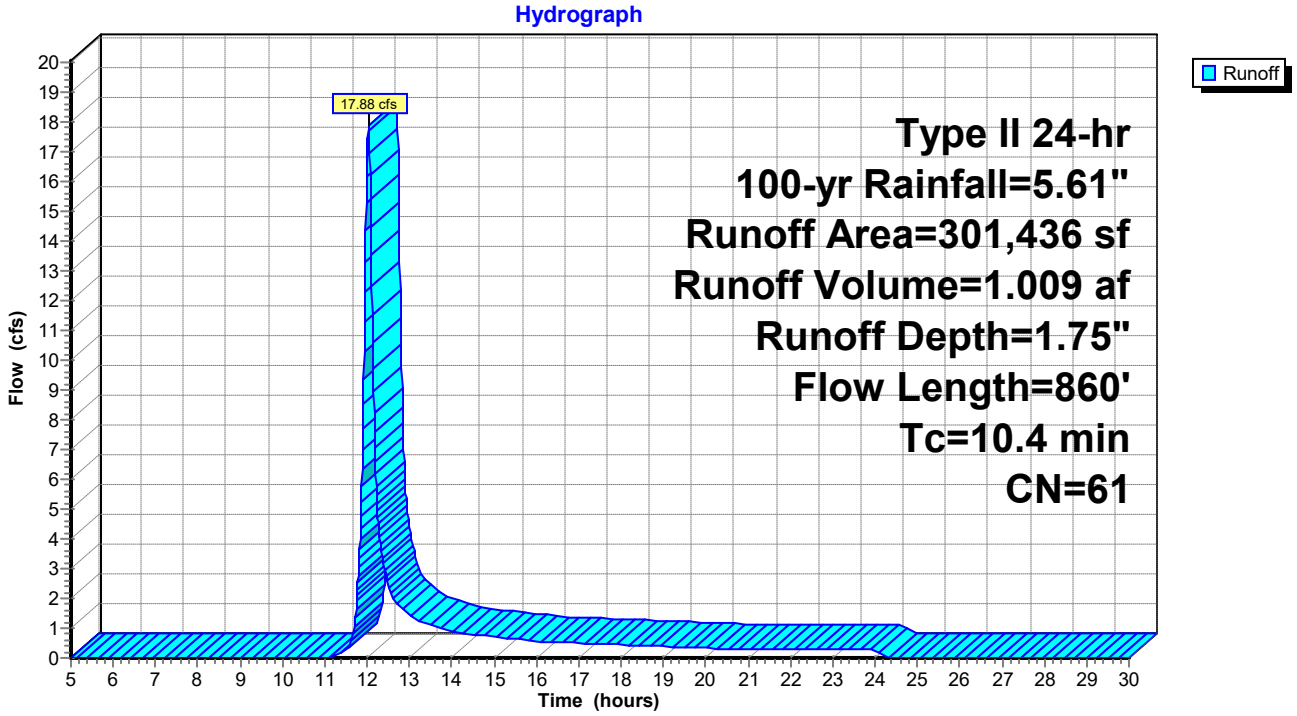
Runoff = 17.88 cfs @ 12.03 hrs, Volume= 1.009 af, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (sf)	CN	Description
134,617	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
21,900	89	Paved roads w/open ditches, 50% imp, HSG B
301,436	61	Weighted Average
290,486		96.37% Pervious Area
10,950		3.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	860	Total			

Subcatchment 27S: DA-1



Hydrograph for Subcatchment 27S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.35	0.00	0.00
5.50	0.40	0.00	0.00
6.00	0.45	0.00	0.00
6.50	0.50	0.00	0.00
7.00	0.56	0.00	0.00
7.50	0.61	0.00	0.00
8.00	0.67	0.00	0.00
8.50	0.74	0.00	0.00
9.00	0.82	0.00	0.00
9.50	0.91	0.00	0.00
10.00	1.02	0.00	0.00
10.50	1.14	0.00	0.00
11.00	1.32	0.00	0.00
11.50	1.59	0.01	0.26
12.00	3.72	0.67	**16.85**
12.50	4.12	0.88	**2.48**
13.00	4.33	0.99	1.46
13.50	4.48	1.07	1.11
14.00	4.60	1.14	0.89
14.50	4.70	1.19	0.78
15.00	4.79	1.24	0.71
15.50	4.87	1.29	0.64
16.00	4.94	1.33	0.56
16.50	5.00	1.37	0.52
17.00	5.06	1.40	0.49
17.50	5.11	1.44	0.47
18.00	5.17	1.47	0.44
18.50	5.22	1.50	0.41
19.00	5.26	1.53	0.39
19.50	5.30	1.55	0.36
20.00	5.34	1.58	0.33
20.50	5.38	1.60	0.32
21.00	5.41	1.62	0.31
21.50	5.45	1.65	0.31
22.00	5.48	1.67	0.30
22.50	5.51	1.69	0.30
23.00	5.55	1.71	0.29
23.50	5.58	1.73	0.28
24.00	**5.61**	**1.75**	0.28
24.50	5.61	1.75	0.00
25.00	5.61	1.75	0.00
25.50	5.61	1.75	0.00
26.00	5.61	1.75	0.00
26.50	5.61	1.75	0.00
27.00	5.61	1.75	0.00
27.50	5.61	1.75	0.00
28.00	5.61	1.75	0.00
28.50	5.61	1.75	0.00
29.00	5.61	1.75	0.00
29.50	5.61	1.75	0.00
30.00	5.61	1.75	0.00

Summary for Subcatchment 31S: DA-2

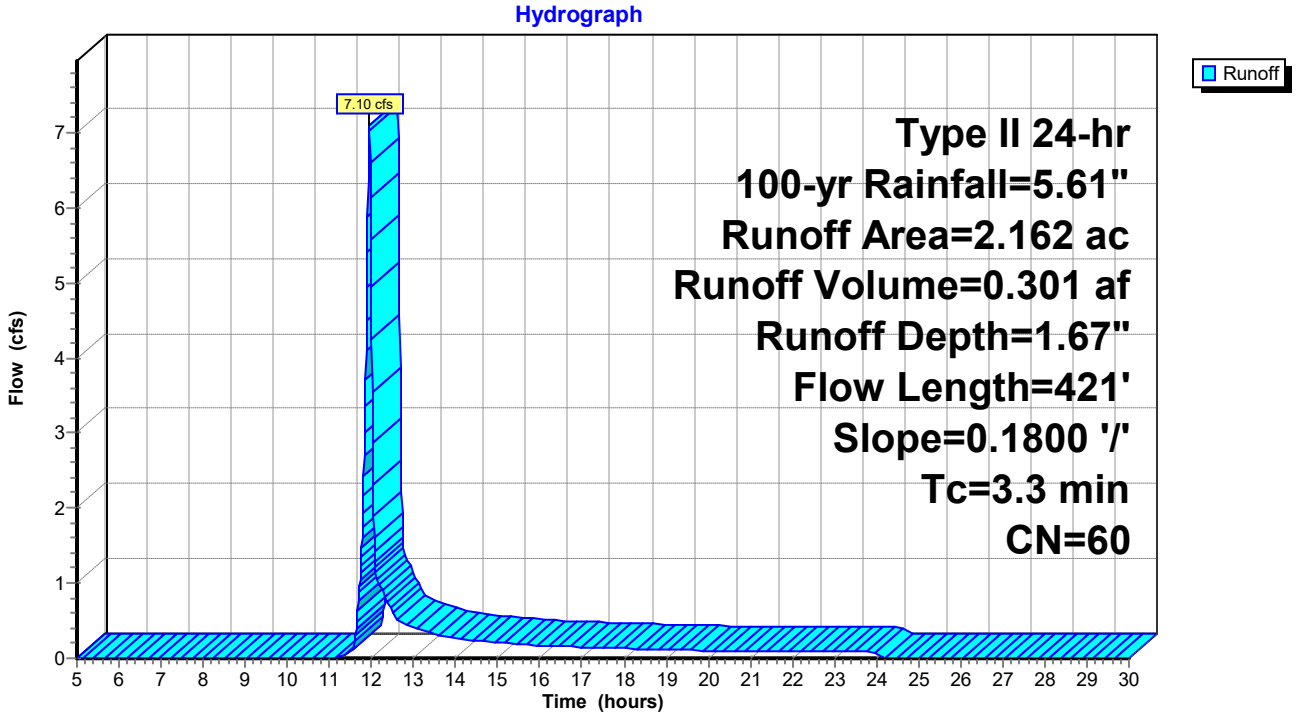
Runoff = 7.10 cfs @ 11.95 hrs, Volume= 0.301 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 31S: DA-2



Hydrograph for Subcatchment 31S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.35	0.00	0.00
5.50	0.40	0.00	0.00
6.00	0.45	0.00	0.00
6.50	0.50	0.00	0.00
7.00	0.56	0.00	0.00
7.50	0.61	0.00	0.00
8.00	0.67	0.00	0.00
8.50	0.74	0.00	0.00
9.00	0.82	0.00	0.00
9.50	0.91	0.00	0.00
10.00	1.02	0.00	0.00
10.50	1.14	0.00	0.00
11.00	1.32	0.00	0.00
11.50	1.59	0.01	**0.09**
12.00	3.72	0.63	**4.94**
12.50	4.12	0.82	0.60
13.00	4.33	0.93	0.41
13.50	4.48	1.01	0.32
14.00	4.60	1.07	0.26
14.50	4.70	1.13	0.23
15.00	4.79	1.18	0.21
15.50	4.87	1.22	0.19
16.00	4.94	1.26	0.17
16.50	5.00	1.30	0.16
17.00	5.06	1.34	0.15
17.50	5.11	1.37	0.14
18.00	5.17	1.40	0.13
18.50	5.22	1.43	0.12
19.00	5.26	1.46	0.12
19.50	5.30	1.48	0.11
20.00	5.34	1.50	0.10
20.50	5.38	1.53	0.10
21.00	5.41	1.55	0.09
21.50	5.45	1.57	0.09
22.00	5.48	1.59	0.09
22.50	5.51	1.61	0.09
23.00	5.55	1.63	0.09
23.50	5.58	1.65	0.09
24.00	**5.61**	**1.67**	0.08
24.50	5.61	1.67	0.00
25.00	5.61	1.67	0.00
25.50	5.61	1.67	0.00
26.00	5.61	1.67	0.00
26.50	5.61	1.67	0.00
27.00	5.61	1.67	0.00
27.50	5.61	1.67	0.00
28.00	5.61	1.67	0.00
28.50	5.61	1.67	0.00
29.00	5.61	1.67	0.00
29.50	5.61	1.67	0.00
30.00	5.61	1.67	0.00

Summary for Subcatchment 32S: DA-2

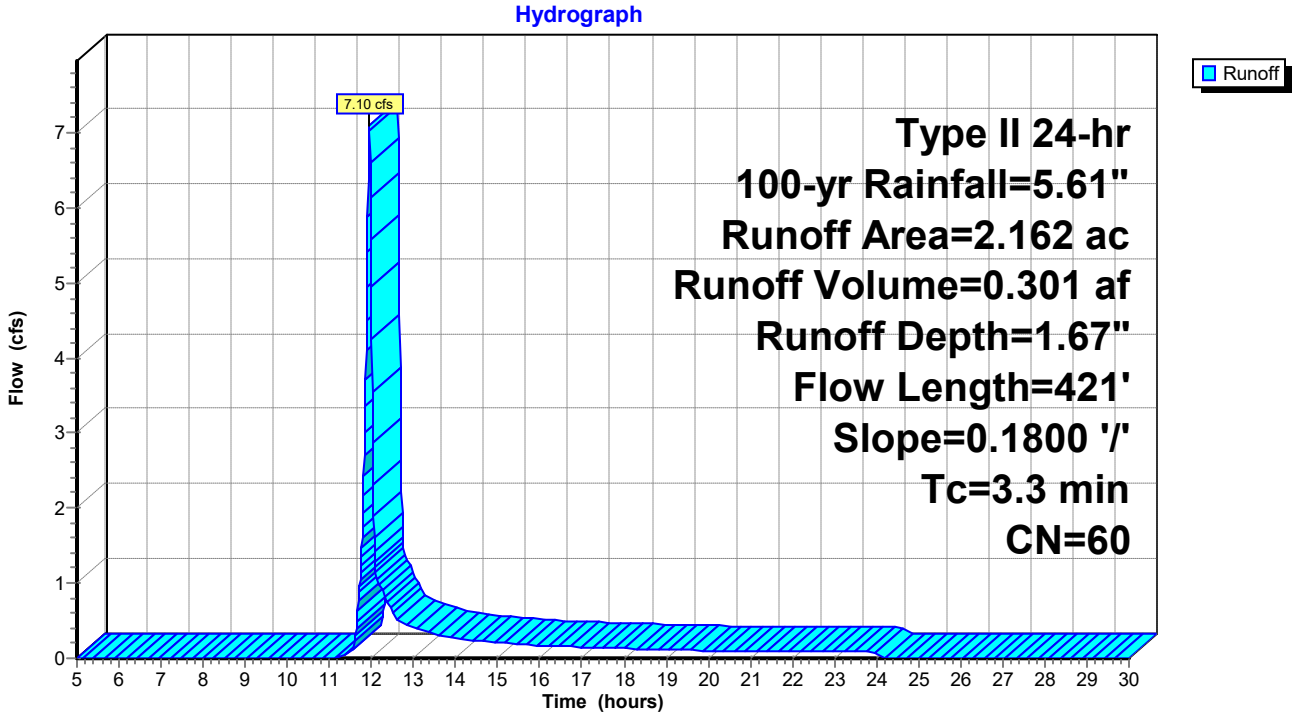
Runoff = 7.10 cfs @ 11.95 hrs, Volume= 0.301 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (ac)	CN	Description
2.137	60	Woods, Fair, HSG B
0.025	71	Meadow, non-grazed, HSG C
2.162	60	Weighted Average
2.162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	421	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps

Subcatchment 32S: DA-2



Hydrograph for Subcatchment 32S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.35	0.00	0.00
5.50	0.40	0.00	0.00
6.00	0.45	0.00	0.00
6.50	0.50	0.00	0.00
7.00	0.56	0.00	0.00
7.50	0.61	0.00	0.00
8.00	0.67	0.00	0.00
8.50	0.74	0.00	0.00
9.00	0.82	0.00	0.00
9.50	0.91	0.00	0.00
10.00	1.02	0.00	0.00
10.50	1.14	0.00	0.00
11.00	1.32	0.00	0.00
11.50	1.59	0.01	**0.09**
12.00	3.72	0.63	**4.94**
12.50	4.12	0.82	0.60
13.00	4.33	0.93	0.41
13.50	4.48	1.01	0.32
14.00	4.60	1.07	0.26
14.50	4.70	1.13	0.23
15.00	4.79	1.18	0.21
15.50	4.87	1.22	0.19
16.00	4.94	1.26	0.17
16.50	5.00	1.30	0.16
17.00	5.06	1.34	0.15
17.50	5.11	1.37	0.14
18.00	5.17	1.40	0.13
18.50	5.22	1.43	0.12
19.00	5.26	1.46	0.12
19.50	5.30	1.48	0.11
20.00	5.34	1.50	0.10
20.50	5.38	1.53	0.10
21.00	5.41	1.55	0.09
21.50	5.45	1.57	0.09
22.00	5.48	1.59	0.09
22.50	5.51	1.61	0.09
23.00	5.55	1.63	0.09
23.50	5.58	1.65	0.09
24.00	**5.61**	**1.67**	0.08
24.50	5.61	1.67	0.00
25.00	5.61	1.67	0.00
25.50	5.61	1.67	0.00
26.00	5.61	1.67	0.00
26.50	5.61	1.67	0.00
27.00	5.61	1.67	0.00
27.50	5.61	1.67	0.00
28.00	5.61	1.67	0.00
28.50	5.61	1.67	0.00
29.00	5.61	1.67	0.00
29.50	5.61	1.67	0.00
30.00	5.61	1.67	0.00

Summary for Subcatchment 33S: DA-1

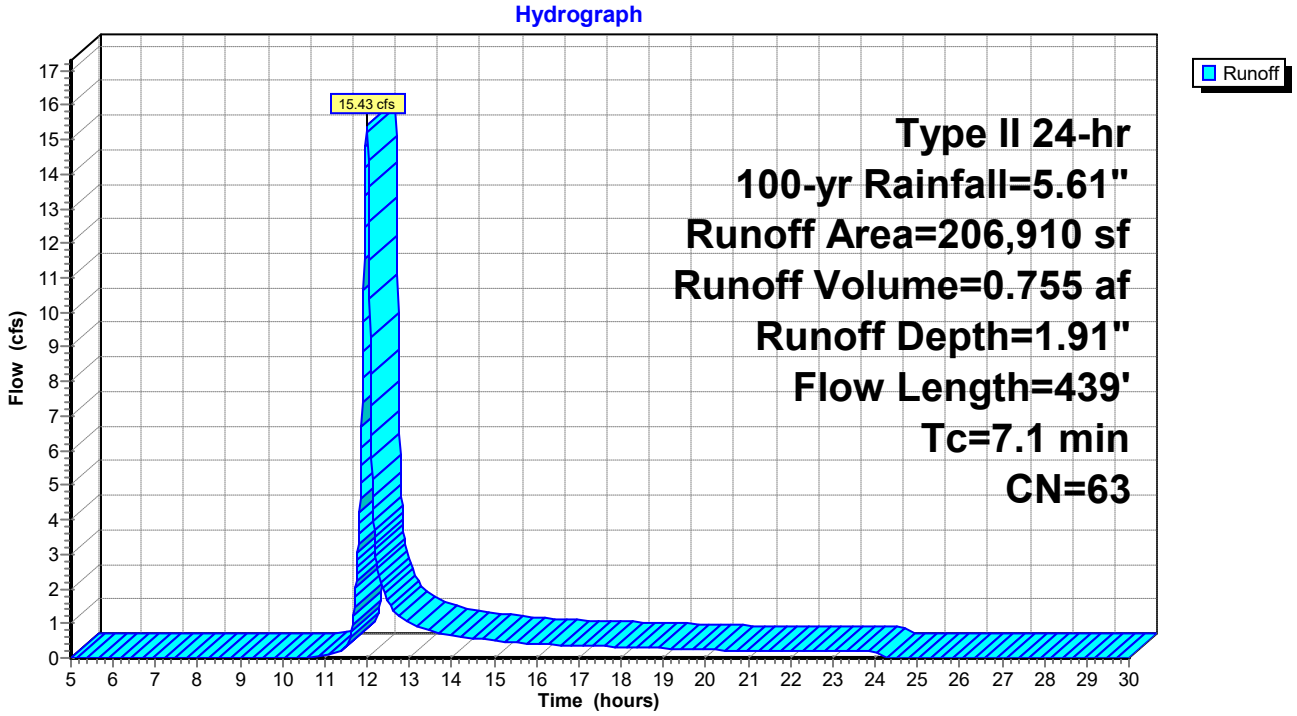
Runoff = 15.43 cfs @ 11.99 hrs, Volume= 0.755 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (sf)	CN	Description
36,765	58	Meadow, non-grazed, HSG B
144,924	60	Woods, Fair, HSG B
25,221	89	Paved roads w/open ditches, 50% imp, HSG B
206,910	63	Weighted Average
194,300		93.91% Pervious Area
12,611		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 33S: DA-1



Hydrograph for Subcatchment 33S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.35	0.00	0.00
5.50	0.40	0.00	0.00
6.00	0.45	0.00	0.00
6.50	0.50	0.00	0.00
7.00	0.56	0.00	0.00
7.50	0.61	0.00	0.00
8.00	0.67	0.00	0.00
8.50	0.74	0.00	0.00
9.00	0.82	0.00	0.00
9.50	0.91	0.00	0.00
10.00	1.02	0.00	0.00
10.50	1.14	0.00	0.00
11.00	1.32	0.00	0.06
11.50	1.59	0.03	**0.32**
12.00	3.72	0.77	**15.36**
12.50	4.12	0.99	1.66
13.00	4.33	1.10	1.03
13.50	4.48	1.19	0.79
14.00	4.60	1.26	0.63
14.50	4.70	1.32	0.56
15.00	4.79	1.38	0.51
15.50	4.87	1.43	0.46
16.00	4.94	1.47	0.40
16.50	5.00	1.51	0.37
17.00	5.06	1.55	0.36
17.50	5.11	1.58	0.34
18.00	5.17	1.62	0.32
18.50	5.22	1.65	0.30
19.00	5.26	1.68	0.28
19.50	5.30	1.70	0.26
20.00	5.34	1.73	0.23
20.50	5.38	1.75	0.23
21.00	5.41	1.78	0.22
21.50	5.45	1.80	0.22
22.00	5.48	1.82	0.22
22.50	5.51	1.84	0.21
23.00	5.55	1.87	0.21
23.50	5.58	1.89	0.20
24.00	**5.61**	**1.91**	0.20
24.50	5.61	1.91	0.00
25.00	5.61	1.91	0.00
25.50	5.61	1.91	0.00
26.00	5.61	1.91	0.00
26.50	5.61	1.91	0.00
27.00	5.61	1.91	0.00
27.50	5.61	1.91	0.00
28.00	5.61	1.91	0.00
28.50	5.61	1.91	0.00
29.00	5.61	1.91	0.00
29.50	5.61	1.91	0.00
30.00	5.61	1.91	0.00

Summary for Subcatchment 34S: DA-1

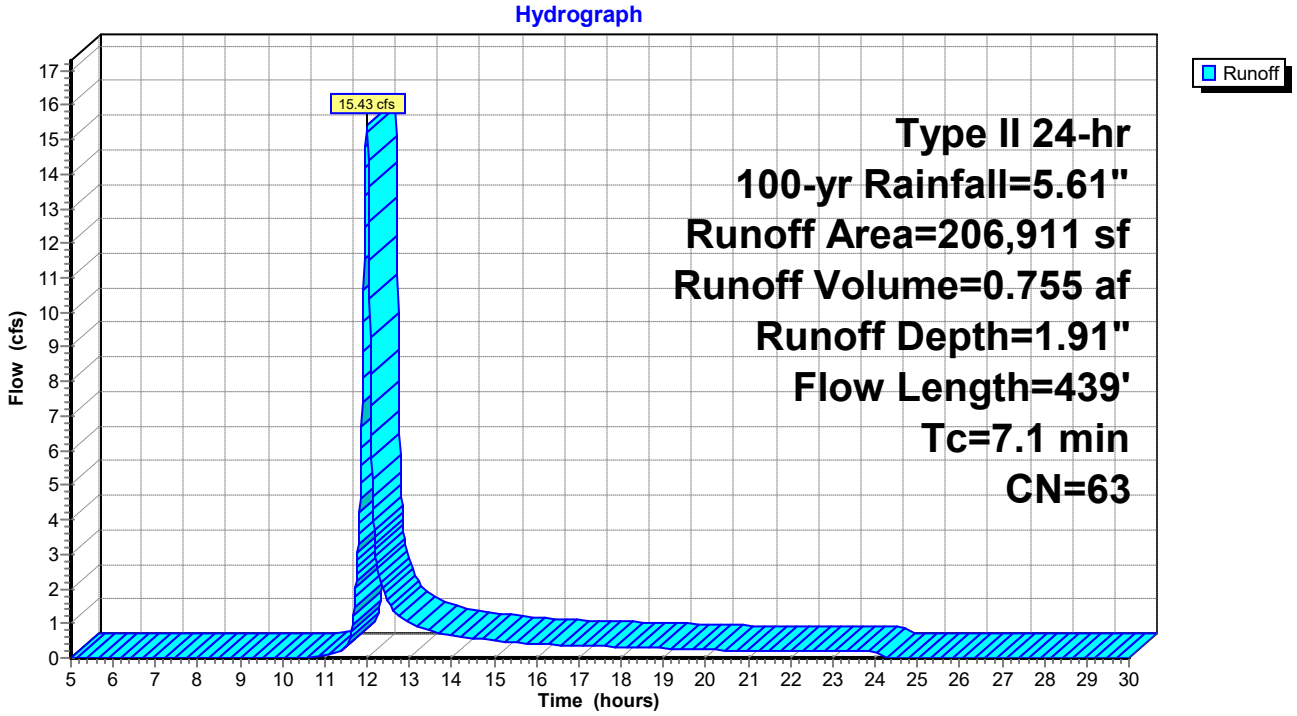
Runoff = 15.43 cfs @ 11.99 hrs, Volume= 0.755 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.61"

Area (sf)	CN	Description
36,785	58	Meadow, non-grazed, HSG B
144,919	60	Woods, Fair, HSG B
25,207	89	Paved roads w/open ditches, 50% imp, HSG B
206,911	63	Weighted Average
194,308		93.91% Pervious Area
12,604		6.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	70	0.0860	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.58"
0.8	107	0.0940	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	99	0.2020	2.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	163	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	439	Total			

Subcatchment 34S: DA-1



Hydrograph for Subcatchment 34S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.35	0.00	0.00
5.50	0.40	0.00	0.00
6.00	0.45	0.00	0.00
6.50	0.50	0.00	0.00
7.00	0.56	0.00	0.00
7.50	0.61	0.00	0.00
8.00	0.67	0.00	0.00
8.50	0.74	0.00	0.00
9.00	0.82	0.00	0.00
9.50	0.91	0.00	0.00
10.00	1.02	0.00	0.00
10.50	1.14	0.00	0.00
11.00	1.32	0.00	0.06
11.50	1.59	0.03	**0.32**
12.00	3.72	0.77	**15.36**
12.50	4.12	0.99	1.66
13.00	4.33	1.10	1.03
13.50	4.48	1.19	0.79
14.00	4.60	1.26	0.63
14.50	4.70	1.32	0.56
15.00	4.79	1.38	0.51
15.50	4.87	1.43	0.46
16.00	4.94	1.47	0.40
16.50	5.00	1.51	0.37
17.00	5.06	1.55	0.36
17.50	5.11	1.58	0.34
18.00	5.17	1.62	0.32
18.50	5.22	1.65	0.30
19.00	5.26	1.68	0.28
19.50	5.30	1.70	0.26
20.00	5.34	1.73	0.23
20.50	5.38	1.75	0.23
21.00	5.41	1.78	0.22
21.50	5.45	1.80	0.22
22.00	5.48	1.82	0.22
22.50	5.51	1.84	0.21
23.00	5.55	1.87	0.21
23.50	5.58	1.89	0.20
24.00	**5.61**	**1.91**	0.20
24.50	5.61	1.91	0.00
25.00	5.61	1.91	0.00
25.50	5.61	1.91	0.00
26.00	5.61	1.91	0.00
26.50	5.61	1.91	0.00
27.00	5.61	1.91	0.00
27.50	5.61	1.91	0.00
28.00	5.61	1.91	0.00
28.50	5.61	1.91	0.00
29.00	5.61	1.91	0.00
29.50	5.61	1.91	0.00
30.00	5.61	1.91	0.00

Summary for Pond 16P: Infiltration Berm+Amended Soil

Inflow Area =	4.750 ac,	6.09% Impervious,	Inflow Depth =	1.91"	for 100-yr event
Inflow =	15.43 cfs @	11.99 hrs,	Volume=	0.755 af	
Outflow =	14.28 cfs @	12.02 hrs,	Volume=	0.570 af,	Atten= 7%, Lag= 1.9 min
Primary =	14.28 cfs @	12.02 hrs,	Volume=	0.570 af	

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,689.59' @ 12.02 hrs Surf.Area= 0.144 ac Storage= 0.198 af

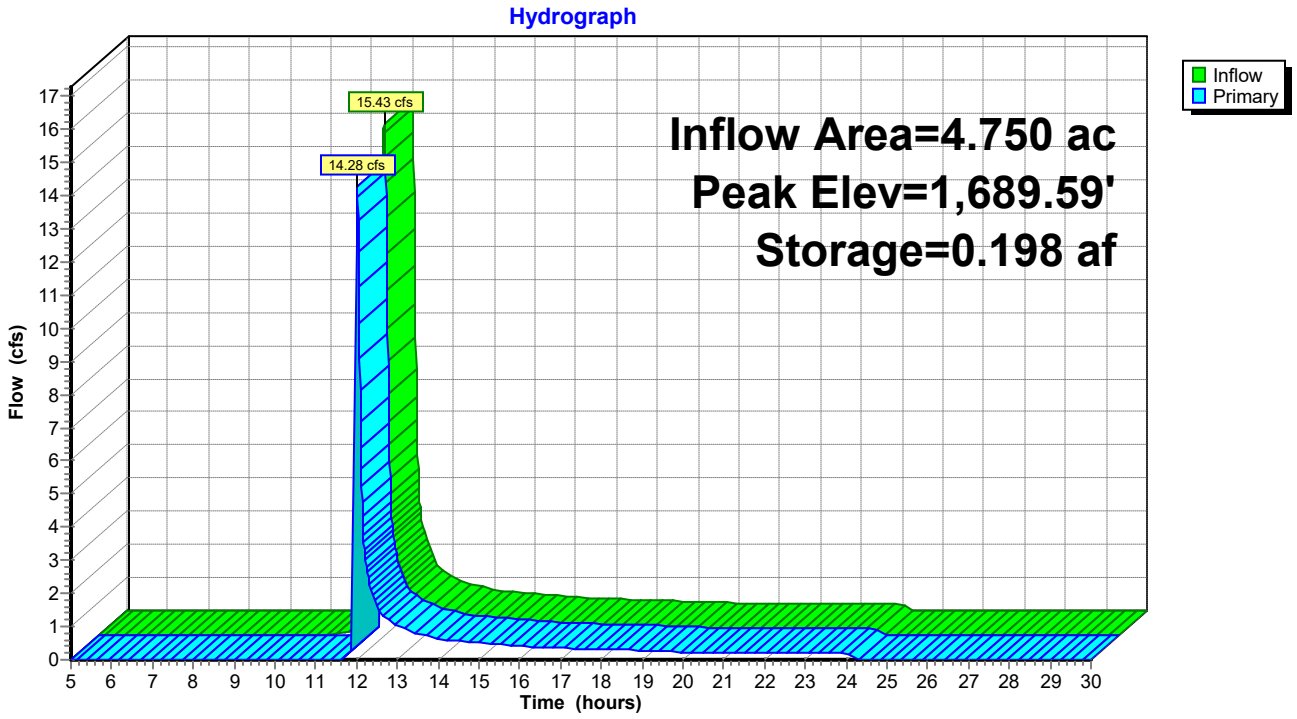
Plug-Flow detention time= 148.3 min calculated for 0.570 af (75% of inflow)
Center-of-Mass det. time= 48.6 min (905.4 - 856.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,688.00'	0.200 af	**20.00'W x 231.00'L x 1.60'H Prismatoid Z=2.0**

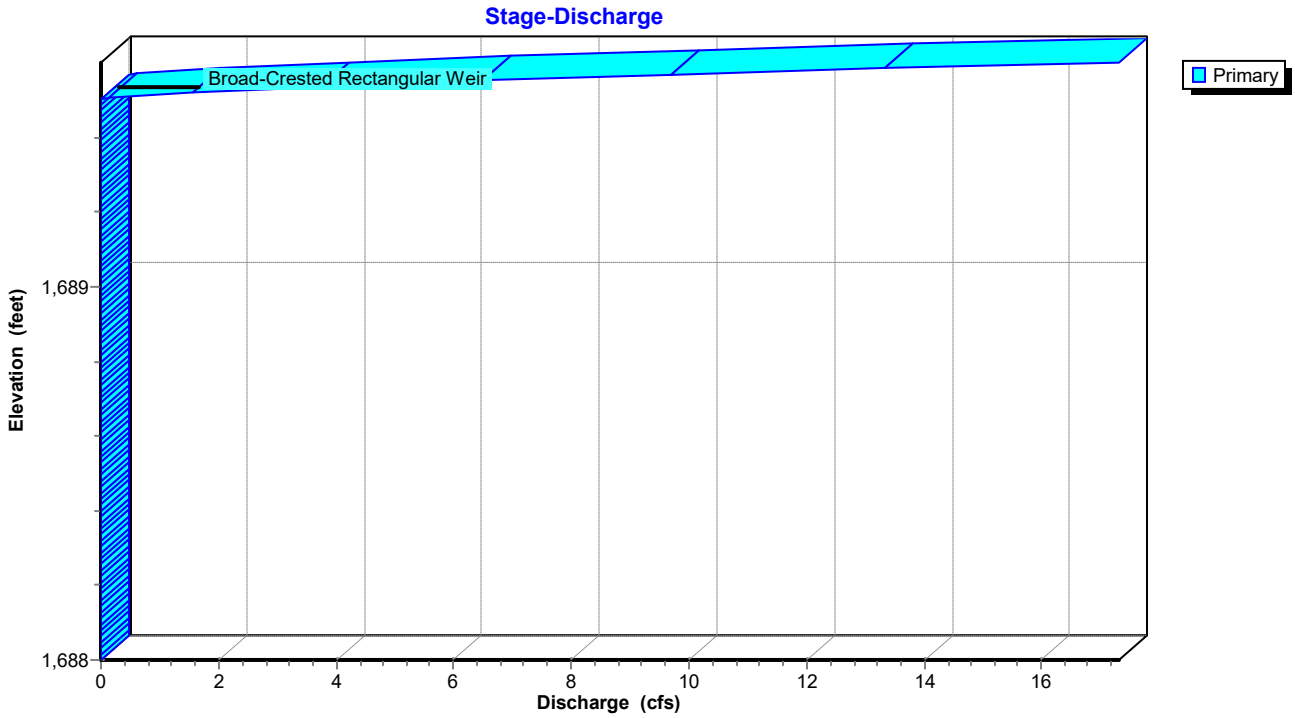
Device	Routing	Invert	Outlet Devices
#1	Primary	1,689.50'	**231.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=14.04 cfs @ 12.02 hrs HW=1,689.59' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 14.04 cfs @ 0.70 fps)

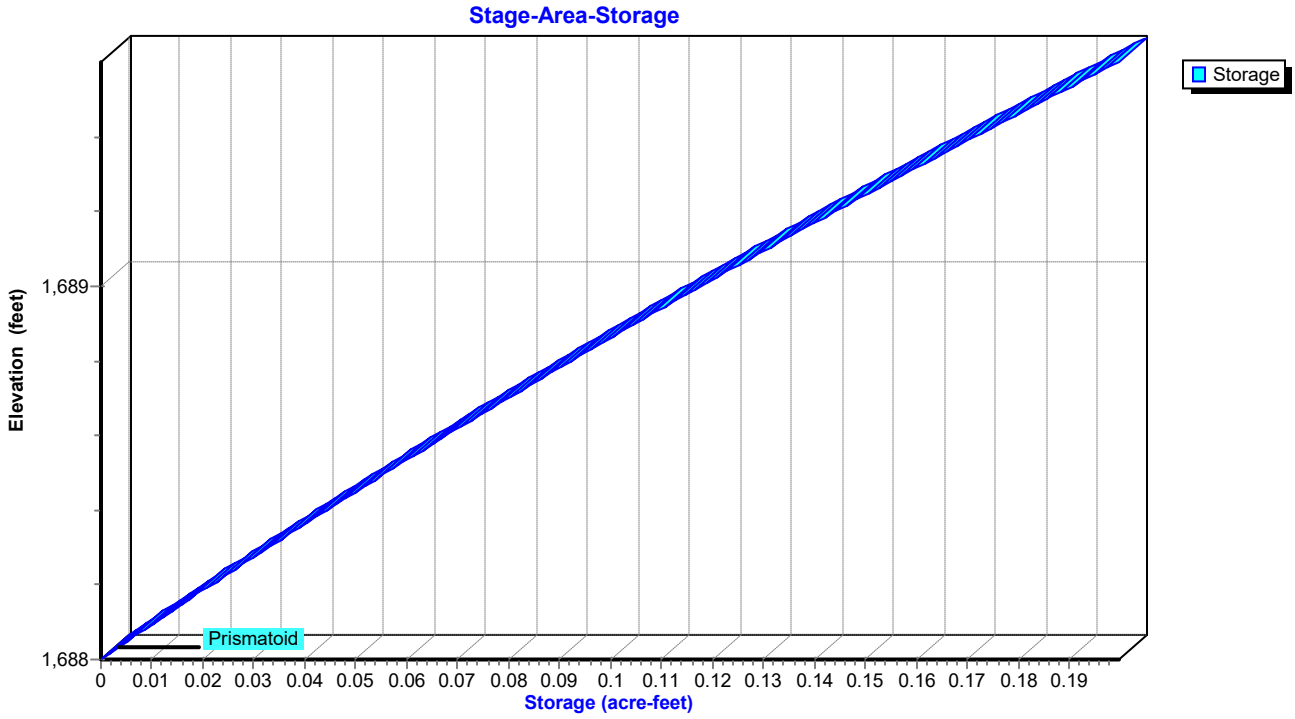
Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Pond 16P: Infiltration Berm+Amended Soil



Hydrograph for Pond 16P: Infiltration Berm+Amended Soil

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0.000	1,688.00	0.00
5.50	0.00	0.000	1,688.00	0.00
6.00	0.00	0.000	1,688.00	0.00
6.50	0.00	0.000	1,688.00	0.00
7.00	0.00	0.000	1,688.00	0.00
7.50	0.00	0.000	1,688.00	0.00
8.00	0.00	0.000	1,688.00	0.00
8.50	0.00	0.000	1,688.00	0.00
9.00	0.00	0.000	1,688.00	0.00
9.50	0.00	0.000	1,688.00	0.00
10.00	0.00	0.000	1,688.00	0.00
10.50	0.00	0.000	1,688.00	0.00
11.00	0.06	0.001	1,688.01	0.00
11.50	**0.32**	0.008	1,688.07	0.00
12.00	**15.36**	**0.192**	**1,689.55**	**5.98**
12.50	1.66	**0.188**	**1,689.52**	**1.70**
13.00	1.03	0.187	1,689.51	1.04
13.50	0.79	0.187	1,689.51	0.80
14.00	0.63	0.187	1,689.51	0.64
14.50	0.56	0.187	1,689.51	0.56
15.00	0.51	0.187	1,689.51	0.51
15.50	0.46	0.187	1,689.51	0.46
16.00	0.40	0.186	1,689.51	0.40
16.50	0.37	0.186	1,689.51	0.37
17.00	0.36	0.186	1,689.51	0.36
17.50	0.34	0.186	1,689.51	0.34
18.00	0.32	0.186	1,689.51	0.32
18.50	0.30	0.186	1,689.51	0.30
19.00	0.28	0.186	1,689.51	0.28
19.50	0.26	0.186	1,689.51	0.26
20.00	0.23	0.186	1,689.51	0.24
20.50	0.23	0.186	1,689.51	0.23
21.00	0.22	0.186	1,689.50	0.22
21.50	0.22	0.186	1,689.50	0.22
22.00	0.22	0.186	1,689.50	0.22
22.50	0.21	0.186	1,689.50	0.21
23.00	0.21	0.186	1,689.50	0.21
23.50	0.20	0.186	1,689.50	0.20
24.00	0.20	0.186	1,689.50	0.20
24.50	0.00	0.185	1,689.50	0.00
25.00	0.00	0.185	1,689.50	0.00
25.50	0.00	0.185	1,689.50	0.00
26.00	0.00	0.185	1,689.50	0.00
26.50	0.00	0.185	1,689.50	0.00
27.00	0.00	0.185	1,689.50	0.00
27.50	0.00	0.185	1,689.50	0.00
28.00	0.00	0.185	1,689.50	0.00
28.50	0.00	0.185	1,689.50	0.00
29.00	0.00	0.185	1,689.50	0.00
29.50	0.00	0.185	1,689.50	0.00
30.00	0.00	0.185	1,689.50	0.00

Stage-Discharge for Pond 16P: Infiltration Berm+Amended Soil

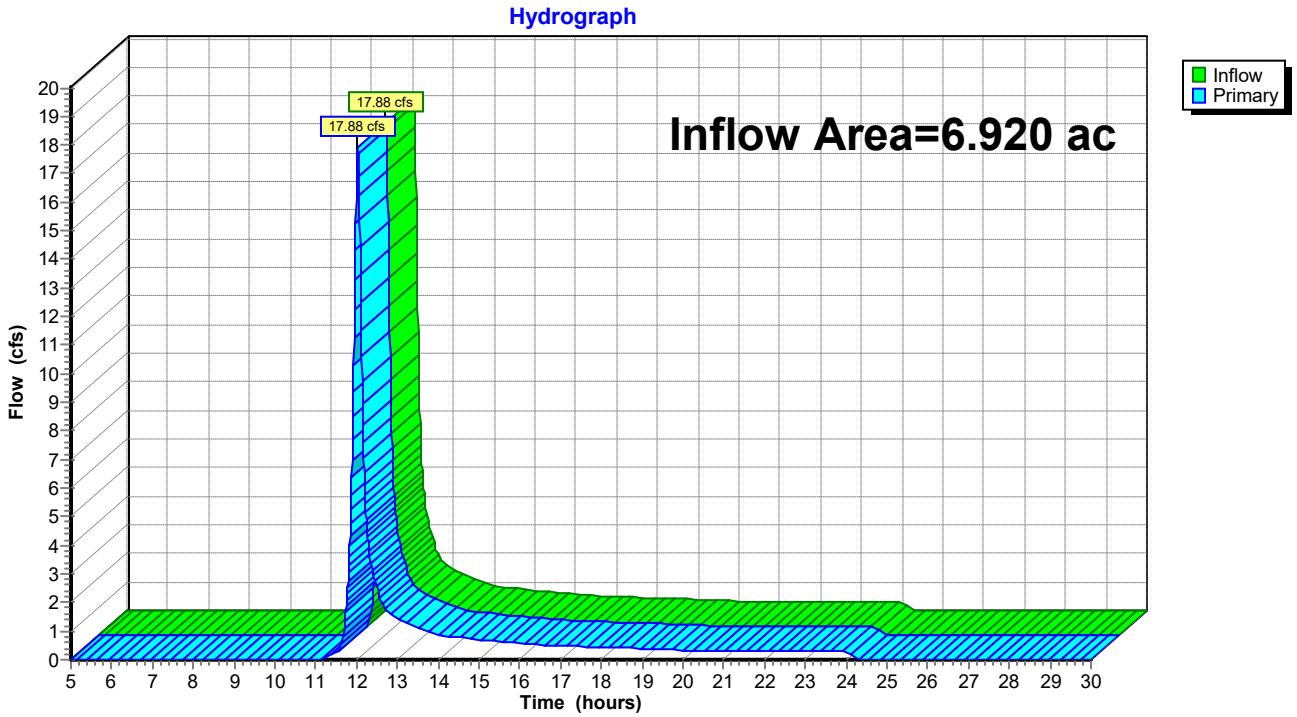
Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,688.00	0.00	1,688.51	0.00	1,689.02	0.00	1,689.53	2.84
1,688.01	0.00	1,688.52	0.00	1,689.03	0.00	1,689.54	4.38
1,688.02	0.00	1,688.53	0.00	1,689.04	0.00	1,689.55	6.12
1,688.03	0.00	1,688.54	0.00	1,689.05	0.00	1,689.56	8.05
1,688.04	0.00	1,688.55	0.00	1,689.06	0.00	1,689.57	10.14
1,688.05	0.00	1,688.56	0.00	1,689.07	0.00	1,689.58	12.39
1,688.06	0.00	1,688.57	0.00	1,689.08	0.00	1,689.59	14.78
1,688.07	0.00	1,688.58	0.00	1,689.09	0.00	1,689.60	**17.31**
1,688.08	0.00	1,688.59	0.00	1,689.10	0.00		
1,688.09	0.00	1,688.60	0.00	1,689.11	0.00		
1,688.10	0.00	1,688.61	0.00	1,689.12	0.00		
1,688.11	0.00	1,688.62	0.00	1,689.13	0.00		
1,688.12	0.00	1,688.63	0.00	1,689.14	0.00		
1,688.13	0.00	1,688.64	0.00	1,689.15	0.00		
1,688.14	0.00	1,688.65	0.00	1,689.16	0.00		
1,688.15	0.00	1,688.66	0.00	1,689.17	0.00		
1,688.16	0.00	1,688.67	0.00	1,689.18	0.00		
1,688.17	0.00	1,688.68	0.00	1,689.19	0.00		
1,688.18	0.00	1,688.69	0.00	1,689.20	0.00		
1,688.19	0.00	1,688.70	0.00	1,689.21	0.00		
1,688.20	0.00	1,688.71	0.00	1,689.22	0.00		
1,688.21	0.00	1,688.72	0.00	1,689.23	0.00		
1,688.22	0.00	1,688.73	0.00	1,689.24	0.00		
1,688.23	0.00	1,688.74	0.00	1,689.25	0.00		
1,688.24	0.00	1,688.75	0.00	1,689.26	0.00		
1,688.25	0.00	1,688.76	0.00	1,689.27	0.00		
1,688.26	0.00	1,688.77	0.00	1,689.28	0.00		
1,688.27	0.00	1,688.78	0.00	1,689.29	0.00		
1,688.28	0.00	1,688.79	0.00	1,689.30	0.00		
1,688.29	0.00	1,688.80	0.00	1,689.31	0.00		
1,688.30	0.00	1,688.81	0.00	1,689.32	0.00		
1,688.31	0.00	1,688.82	0.00	1,689.33	0.00		
1,688.32	0.00	1,688.83	0.00	1,689.34	0.00		
1,688.33	0.00	1,688.84	0.00	1,689.35	0.00		
1,688.34	0.00	1,688.85	0.00	1,689.36	0.00		
1,688.35	0.00	1,688.86	0.00	1,689.37	0.00		
1,688.36	0.00	1,688.87	0.00	1,689.38	0.00		
1,688.37	0.00	1,688.88	0.00	1,689.39	0.00		
1,688.38	0.00	1,688.89	0.00	1,689.40	0.00		
1,688.39	0.00	1,688.90	0.00	1,689.41	0.00		
1,688.40	0.00	1,688.91	0.00	1,689.42	0.00		
1,688.41	0.00	1,688.92	0.00	1,689.43	0.00		
1,688.42	0.00	1,688.93	0.00	1,689.44	0.00		
1,688.43	0.00	1,688.94	0.00	1,689.45	0.00		
1,688.44	0.00	1,688.95	0.00	1,689.46	0.00		
1,688.45	0.00	1,688.96	0.00	1,689.47	0.00		
1,688.46	0.00	1,688.97	0.00	1,689.48	0.00		
1,688.47	0.00	1,688.98	0.00	1,689.49	0.00		
1,688.48	0.00	1,688.99	0.00	1,689.50	0.00		
1,688.49	0.00	1,689.00	0.00	1,689.51	0.55		
1,688.50	0.00	1,689.01	0.00	1,689.52	1.55		

Summary for Link 3L: Pre

Inflow Area = 6.920 ac, 3.63% Impervious, Inflow Depth = 1.75" for 100-yr event
Inflow = 17.88 cfs @ 12.03 hrs, Volume= 1.009 af
Primary = 17.88 cfs @ 12.03 hrs, Volume= 1.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 3L: Pre



Hydrograph for Link 3L: Pre

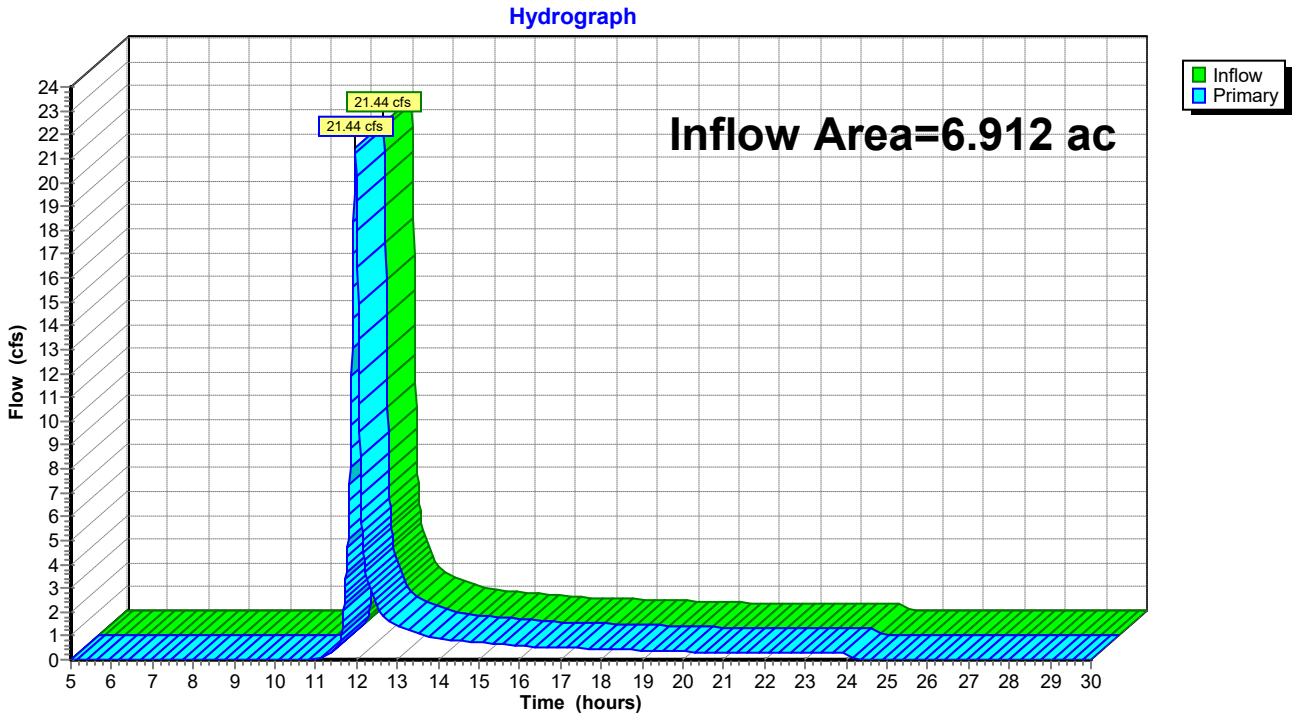
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.26	0.00	0.26
12.00	**16.85**	0.00	**16.85**
12.50	**2.48**	0.00	**2.48**
13.00	1.46	0.00	1.46
13.50	1.11	0.00	1.11
14.00	0.89	0.00	0.89
14.50	0.78	0.00	0.78
15.00	0.71	0.00	0.71
15.50	0.64	0.00	0.64
16.00	0.56	0.00	0.56
16.50	0.52	0.00	0.52
17.00	0.49	0.00	0.49
17.50	0.47	0.00	0.47
18.00	0.44	0.00	0.44
18.50	0.41	0.00	0.41
19.00	0.39	0.00	0.39
19.50	0.36	0.00	0.36
20.00	0.33	0.00	0.33
20.50	0.32	0.00	0.32
21.00	0.31	0.00	0.31
21.50	0.31	0.00	0.31
22.00	0.30	0.00	0.30
22.50	0.30	0.00	0.30
23.00	0.29	0.00	0.29
23.50	0.28	0.00	0.28
24.00	0.28	0.00	0.28
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 6L: Post

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 1.83" for 100-yr event
Inflow = 21.44 cfs @ 11.97 hrs, Volume= 1.057 af
Primary = 21.44 cfs @ 11.97 hrs, Volume= 1.057 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 6L: Post



Hydrograph for Link 6L: Post

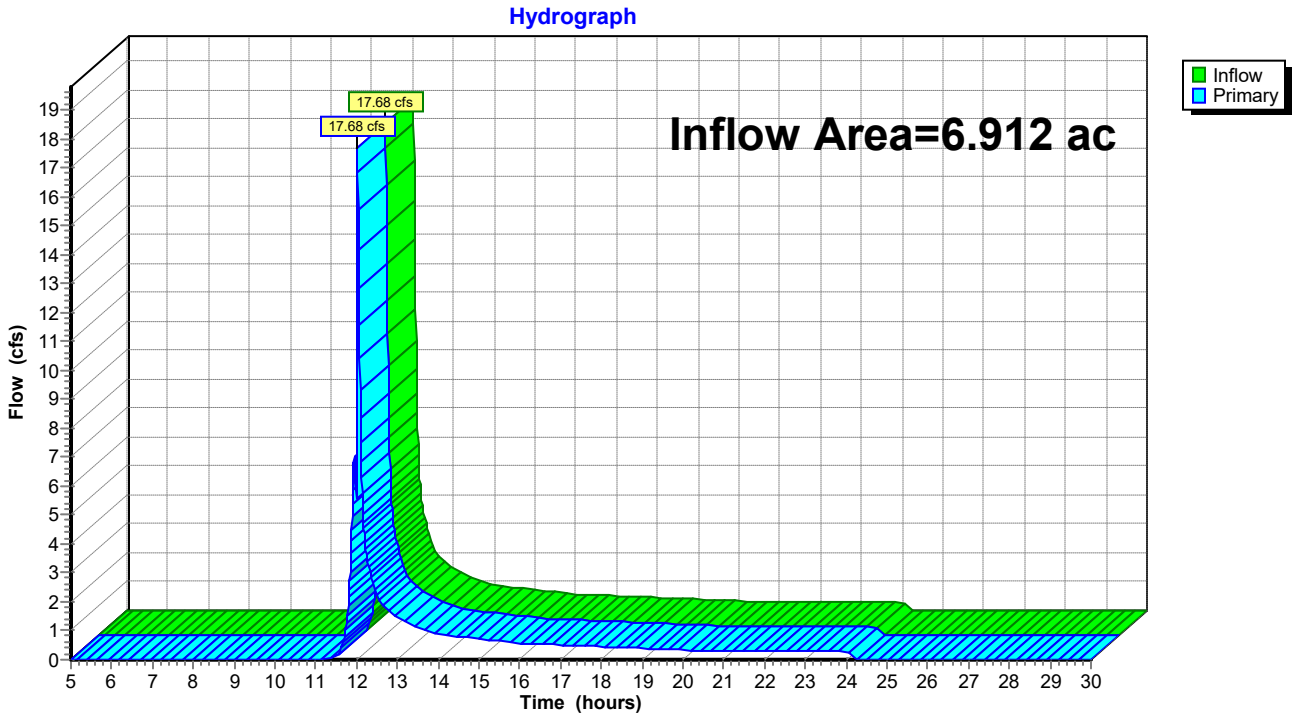
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.06	0.00	0.06
11.50	**0.41**	0.00	**0.41**
12.00	**20.30**	0.00	**20.30**
12.50	2.26	0.00	2.26
13.00	1.43	0.00	1.43
13.50	1.11	0.00	1.11
14.00	0.89	0.00	0.89
14.50	0.79	0.00	0.79
15.00	0.72	0.00	0.72
15.50	0.64	0.00	0.64
16.00	0.57	0.00	0.57
16.50	0.53	0.00	0.53
17.00	0.50	0.00	0.50
17.50	0.48	0.00	0.48
18.00	0.45	0.00	0.45
18.50	0.42	0.00	0.42
19.00	0.39	0.00	0.39
19.50	0.36	0.00	0.36
20.00	0.33	0.00	0.33
20.50	0.32	0.00	0.32
21.00	0.32	0.00	0.32
21.50	0.31	0.00	0.31
22.00	0.31	0.00	0.31
22.50	0.30	0.00	0.30
23.00	0.30	0.00	0.30
23.50	0.29	0.00	0.29
24.00	0.29	0.00	0.29
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Summary for Link 15L: Post w/BMP

Inflow Area = 6.912 ac, 4.19% Impervious, Inflow Depth = 1.51" for 100-yr event
Inflow = 17.68 cfs @ 12.02 hrs, Volume= 0.871 af
Primary = 17.68 cfs @ 12.02 hrs, Volume= 0.871 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.01 hrs

Link 15L: Post w/BMP

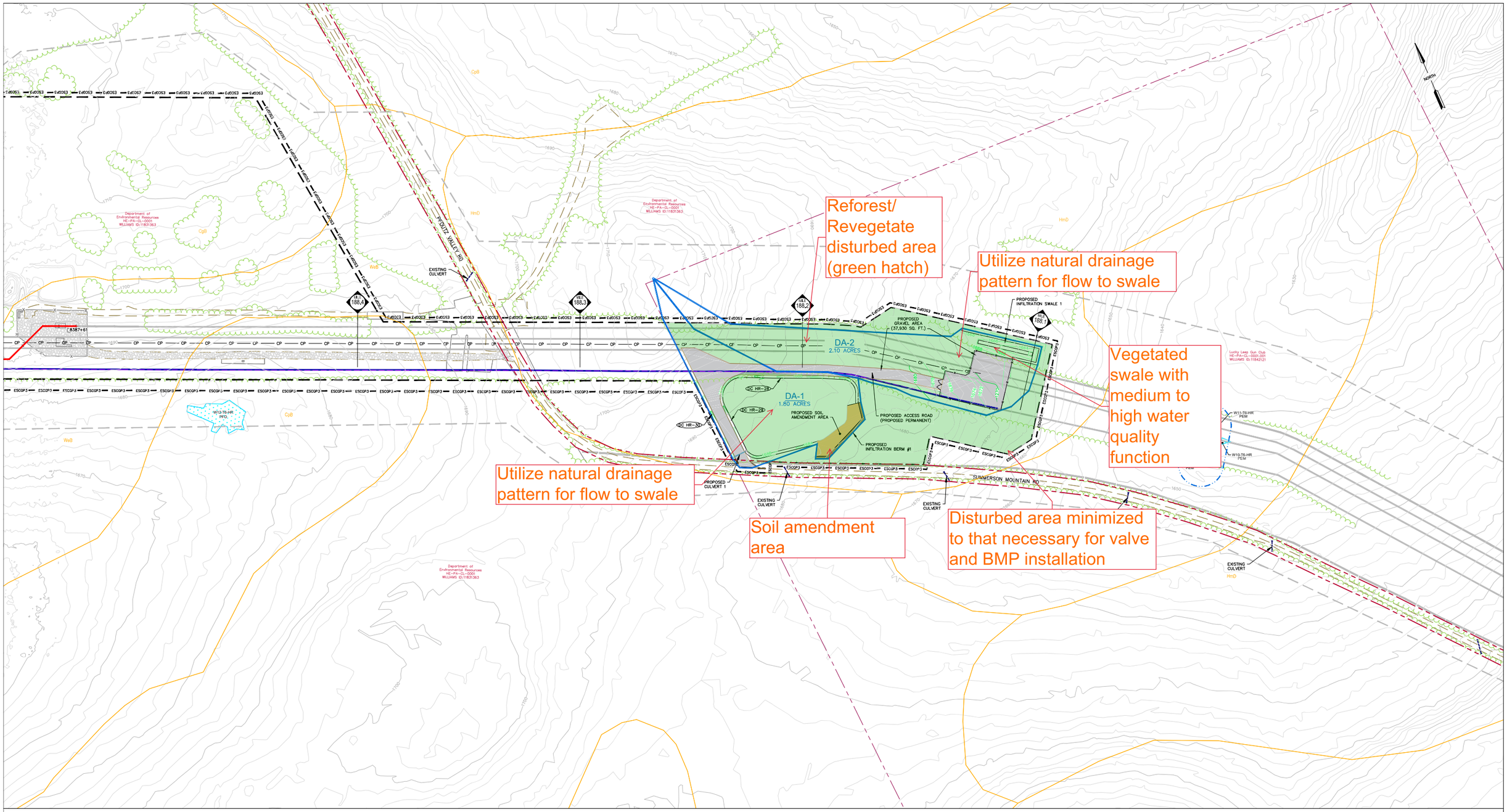


Hydrograph for Link 15L: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.50	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.50	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.50	0.09	0.00	0.09
12.00	**10.92**	0.00	**10.92**
12.50	**2.30**	0.00	**2.30**
13.00	1.45	0.00	1.45
13.50	1.12	0.00	1.12
14.00	0.89	0.00	0.89
14.50	0.79	0.00	0.79
15.00	0.72	0.00	0.72
15.50	0.65	0.00	0.65
16.00	0.57	0.00	0.57
16.50	0.53	0.00	0.53
17.00	0.50	0.00	0.50
17.50	0.48	0.00	0.48
18.00	0.45	0.00	0.45
18.50	0.42	0.00	0.42
19.00	0.39	0.00	0.39
19.50	0.36	0.00	0.36
20.00	0.33	0.00	0.33
20.50	0.32	0.00	0.32
21.00	0.32	0.00	0.32
21.50	0.31	0.00	0.31
22.00	0.31	0.00	0.31
22.50	0.30	0.00	0.30
23.00	0.30	0.00	0.30
23.50	0.29	0.00	0.29
24.00	0.29	0.00	0.29
24.50	0.00	0.00	0.00
25.00	0.00	0.00	0.00
25.50	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.50	0.00	0.00	0.00
27.00	0.00	0.00	0.00
27.50	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.50	0.00	0.00	0.00
29.00	0.00	0.00	0.00
29.50	0.00	0.00	0.00
30.00	0.00	0.00	0.00

ATTACHMENT 5

NON-STRUCTURAL AND STRUCTURAL WATER QUALITY BMPS MAP



EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.

SOIL LEGEND

CpB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

LEGEND

- PROPOSED WATERBAR & OUTLET STRUCTURE
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- PROPOSED PIPELINE
- ESCGP3 — ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA — FEMA 100-YEAR FLOODPLAIN
- MrB2 — SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE "A" ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE "A" ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 — EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 — EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 — PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 — PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- CP — CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT
- POST DEVELOPMENT DRAINAGE AREA

NOT TO SCALE

WHM consulting, inc. — designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER — DATE

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05-04-20	RHM	UPDATED PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC — Williams.

LEIDY SOUTH PROJECT - HENSEL REPLACEMENT

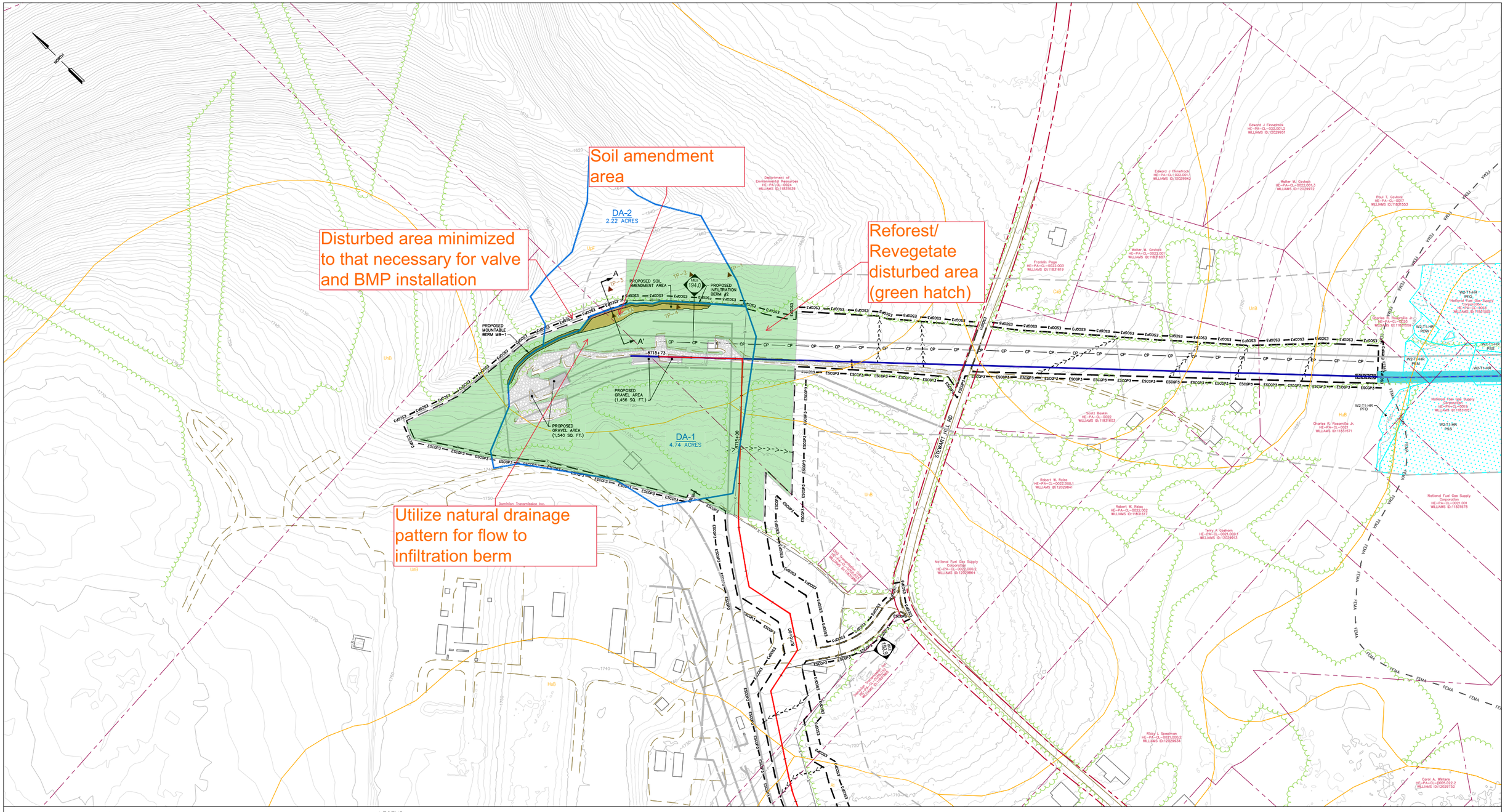
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

EASTERN TERMINUS MAIN LINE VALVES

PROPOSED SITE CONDITIONS

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: SWH	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 5 OF 7
WO: 1211227	RID:		



EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
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5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.

SOIL LEGEND

CaB	CALVIN CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
UnB	UNGERS LOAM, 3 TO 8 PERCENT SLOPES
UpF	UNGERS-MECKESVILLE COMPLEX, 25 TO 50 PERCENT SLOPES, EXTREMELY STONY

LEGEND

- PROPOSED WATERBAR & OUTLET STRUCTURE
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- PROPOSED GRAVEL
- EXISTING GRAVEL AREAS
- EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- EXISTING GRADE MINOR CONTOURS (10' C.I.)
- PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT
- POST DEVELOPMENT DRAINAGE AREA
- TEST PIT

NOT TO SCALE

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
044214-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05-04-20	RHM	UPDATED PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
WESTERN TERMINUS MAIN LINE VALVES
PROPOSED SITE CONDITIONS
LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

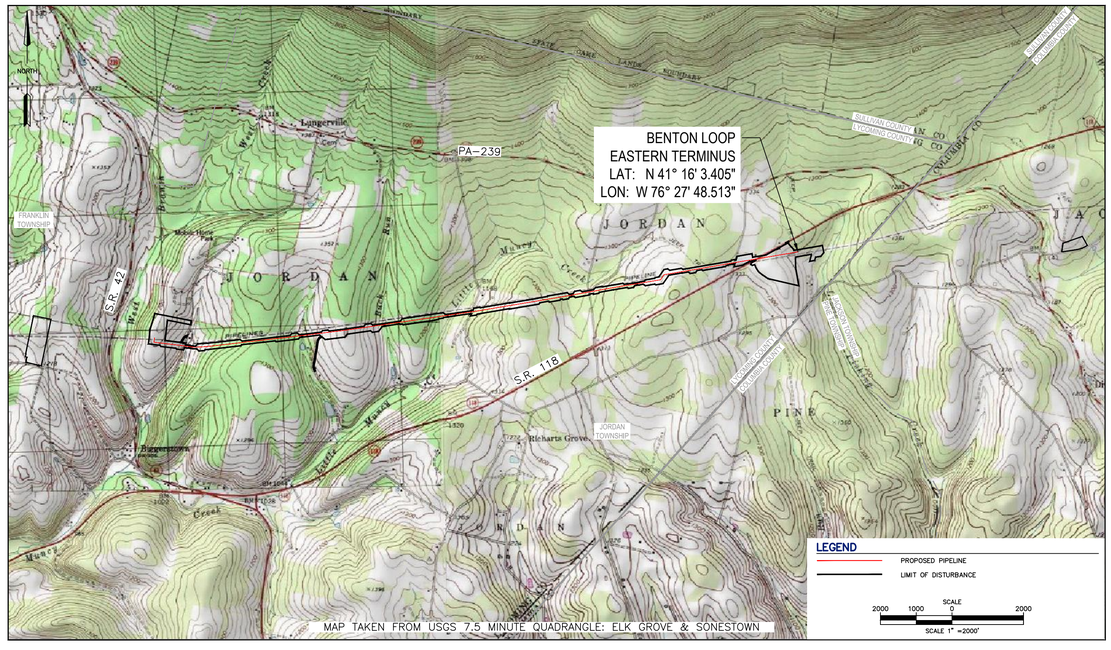
DRAWN BY: SWH	DATE: 4/15/19	ISSUED FOR BID	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 3
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 8

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

LEIDY SOUTH PROJECT
BENTON LOOP - EASTERN TERMINUS MAIN LINE VALVE

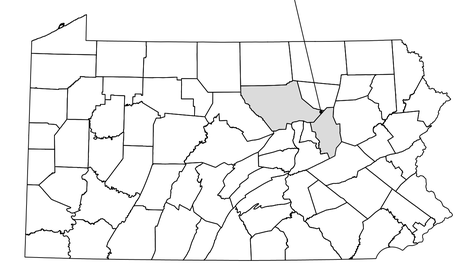
JORDAN TOWNSHIP, LYCOMING COUNTY, PENNSYLVANIA

SEPTEMBER 2019
(REVISED MAY 2020)



LOCATION MAP

PROJECT LOCATION



VICINITY MAP
N.T.S.

PROJECT OWNER/APPLICANT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
2800 POST OAK BLVD. LEVEL 11
HOUSTON, TX. 77056
PH: (713) 215-3427
CONTACT: JOSEPH DEAN, ENVIRONMENTAL MANAGER

PLAN PREPARER / ENGINEER

WHM CONSULTING, INC.
2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803
PH: (814) 689-1650
CONTACT: KEVIN M. CLARK, PROJECT MANAGER

BAI GROUP, LLC.
2525 GREEN TECH DRIVE, SUITE D
STATE COLLEGE, PA 16803
PH: (814) 238-2060
CONTACT: KEVIN C. CLARK, P.E.

SHEET INDEX

SHEET NUMBER	DRAWING TITLE
1 OF 6	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EASTERN TERMINUS MAIN LINE VALVE COVER SHEET
2 OF 6	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EASTERN TERMINUS MAIN LINE VALVE EXISTING CONDITIONS PLAN
3 OF 6	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EASTERN TERMINUS MAIN LINE VALVE PROPOSED CONDITIONS PLAN
4 OF 6	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EASTERN TERMINUS MAIN LINE VALVE NOTES
5 OF 6	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EASTERN TERMINUS MAIN LINE VALVE DETAILS SHEET 1
6 OF 6	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EASTERN TERMINUS MAIN LINE VALVE DETAILS SHEET 2

PROJECT DESCRIPTION

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC (TRANSCO) IS PROPOSING THE BENTON LOOP (PROJECT) LOCATED IN JORDAN TOWNSHIP, LYCOMING COUNTY AND JACKSON TOWNSHIP, COLUMBIA COUNTY, PENNSYLVANIA. THE PROJECT IS LOCATED ON THE ELK GROVE AND SONESTOWN, PENNSYLVANIA, USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE. THE OVERALL SCOPE OF THE PROJECT IS TO INSTALL 3.5 MILES OF 42-INCH PIPELINE CO-LOCATED WITH THE EXISTING TRANSCO LEIDY LINE PIPELINE BETWEEN MILEPOSTS 116.95 AND 120.44.

Call before you dig. 1-800-242-1776 or 811

PENNSYLVANIA ACT 287 (1974) AS AMENDED BY PENNSYLVANIA LESS THAN THREE (3) WORKING DAYS AND NO MORE THAN (10) WORKING DAYS NOTICE TO UTILITIES BEFORE YOU EXCAVATE, DRILL, BLAST OR DEMOLISH.

WHM consulting, inc. designs, permits, resolutions | BAI GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047211-E
PENNSYLVANIA PROFESSIONAL ENGINEER

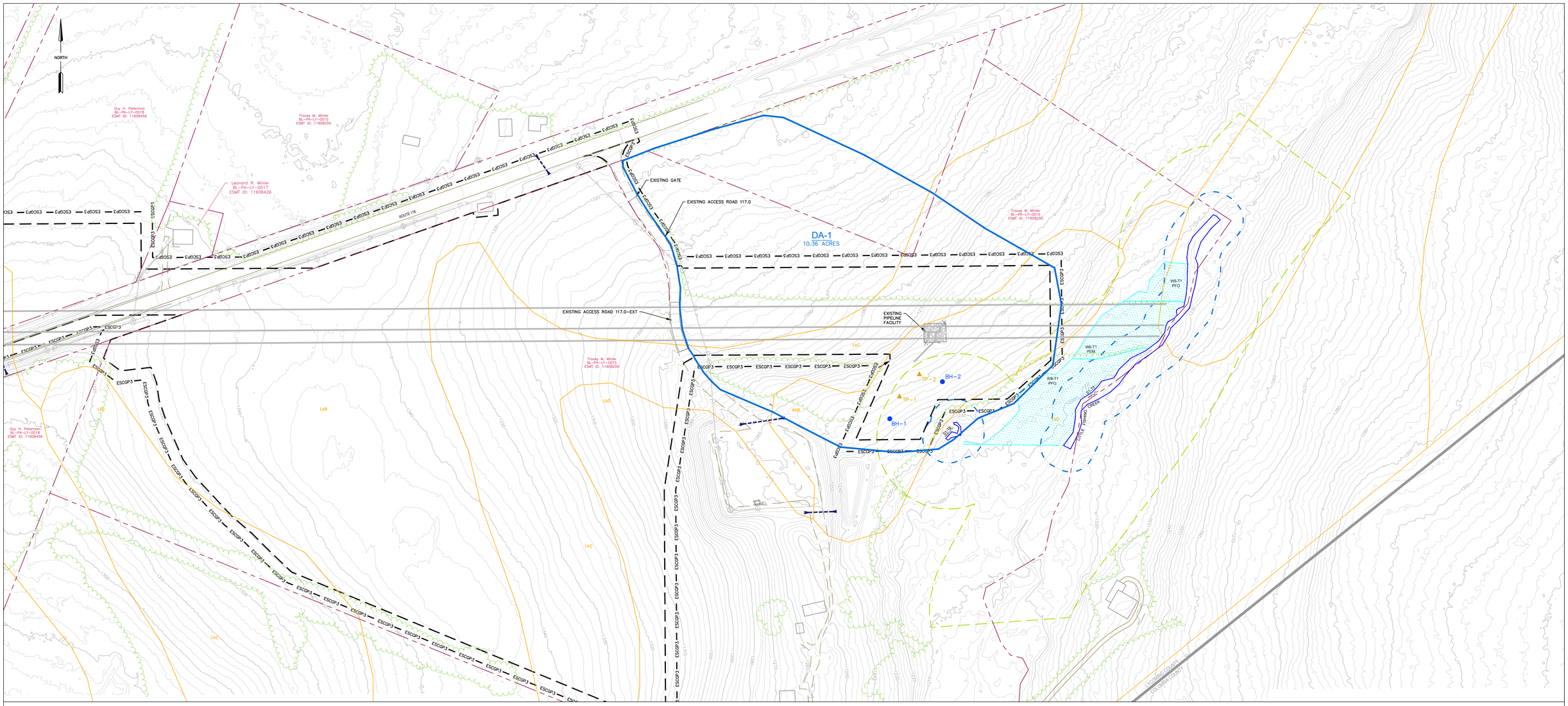
REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05-04-20	RHM	UPDATED PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - BENTON LOOP
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
EASTERN TERMINUS MAIN LINE VALVE
COVER SHEET
JORDAN TOWNSHIP, LYCOMING COUNTY, PENNSYLVANIA

Williams.

DRAWN BY: SWH	DATE: 3/22/19	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 1 OF 6
WO: 121227	RID:		



EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
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3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
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SOIL LEGEND

AbB	ALBRIGHTS SILT LOAM, 3 TO 8 PERCENT SLOPES
LkC	LECK KILL CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES
LkB	LECK KILL CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES

LEGEND

- ESCGP3 — ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA — FEMA 100-YEAR FLOODPLAIN
- MrB2 — SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- 1250 — EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 — EXISTING GRADE MINOR CONTOURS (10' C.I.)
- PRE DEVELOPMENT DRAINAGE AREA
- TP-2 — TEST PIT LOCATION (2019)
- BH-2 — BOREHOLE LOCATION (2020)

SCALE
100 50 0 100
SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
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047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

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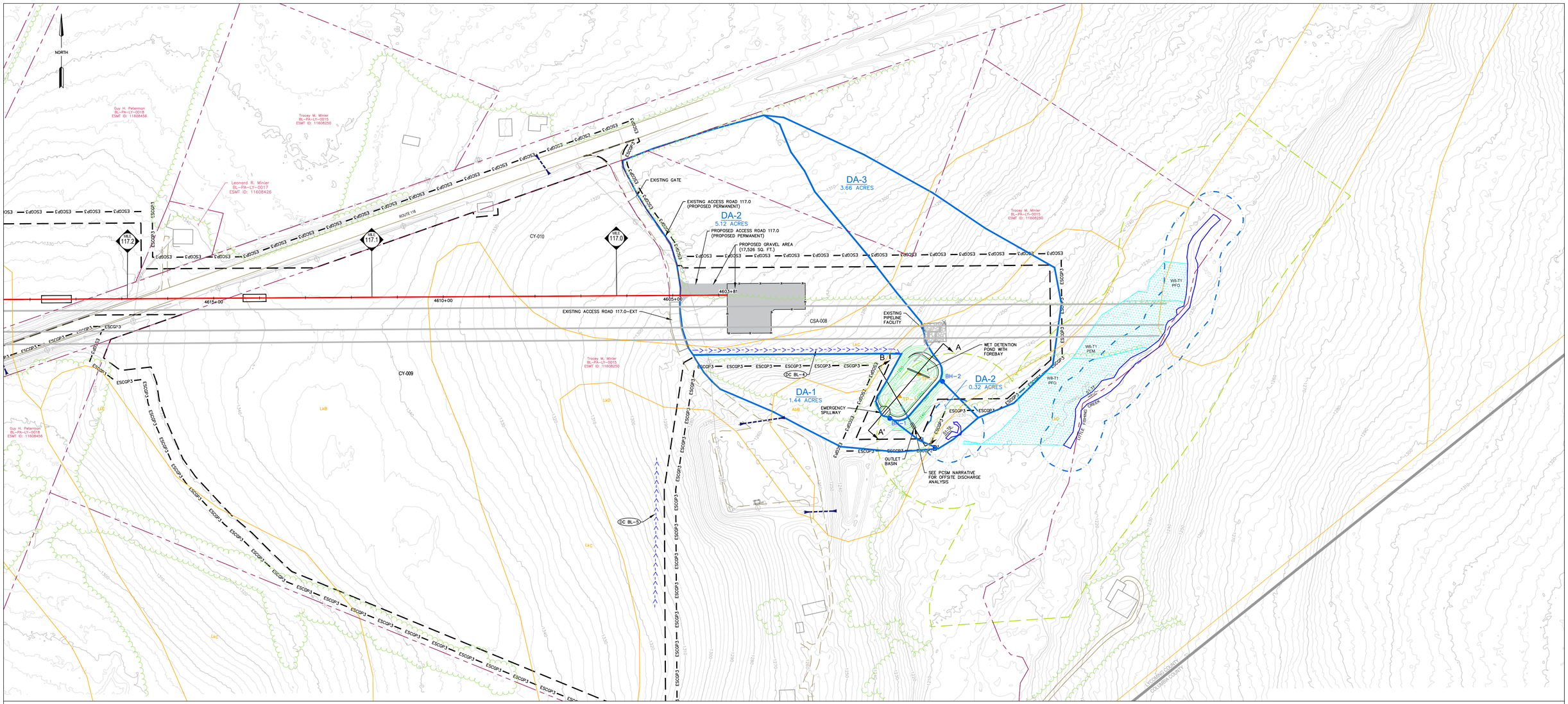
REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05-04-20	RHM	UPDATED PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC — Williams.
LEIDY SOUTH PROJECT - BENTON LOOP
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
EASTERN TERMINUS MAIN LINE VALVE
EXISTING CONDITIONS
JORDAN TOWNSHIP, LYCOMING COUNTY, PENNSYLVANIA

DRAWN BY: SWH	DATE: 3/22/19	ISSUED FOR BID:	SCALE: 1" = 1000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 2
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 6



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LkB	LECK KILL CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES

LEGEND

	DIVERSION CHANNEL		EXISTING UTILITY LINE
	PROPOSED PIPELINE		EXISTING VALVE
ESCGP3	ESCGP-3 PERMIT BOUNDARY		EXISTING CULVERT
	LIMITS OF DISTURBANCE	X	EXISTING FENCE
	APPROX. ENVIRONMENTAL STUDY LIMITS	X	PROPOSED FENCE
	DELINEATED WETLAND		EXISTING STRUCTURE
	DELINEATED WATERWAY / STREAM (TOP OF BANK)		EXISTING ROAD (GRAVEL)
	STREAM FLOW DIRECTION		EXISTING ROAD (PAVED)
	RIPARIAN BUFFER		EXISTING GRAVEL AREAS
	50'/FEMA FLOODWAY		PROPOSED GRAVEL
FEMA	FEMA 100-YEAR FLOODPLAIN	1250	EXISTING GRADE MAJOR CONTOURS (2' C.I.)
LkC	SOIL BOUNDARY / TYPE	1244	EXISTING GRADE MINOR CONTOURS (10' C.I.)
	EXISTING TREELINE / TREE/SHRUB	1250	PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
	PROPERTY LINE	1244	PROPOSED GRADE MINOR CONTOURS (10' C.I.)
	EXISTING LEIDY / TGPL PIPELINES		PROPOSED CULVERT
	EXISTING FOREIGN PIPELINES		POST DEVELOPMENT DRAINAGE AREA
	EXISTING UTILITY POLE / TOWER	TP-2	TEST PIT LOCATION (2019)
		BH-2	BOREHOLE LOCATION (2020)

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RESOLUTION TO SOIL LIMITATIONS

TRANSCO PROPOSES THE FOLLOWING RESOLUTIONS TO COMPENSATE FOR SOIL LIMITATIONS SUMMARIZED IN TABLE 3 BELOW:

1. TO OFFSET THE CAVING OF CUTBANKS, TRENCHING OPERATIONS WILL BE CONDUCTED IN ACCORDANCE WITH THE OSHA TECHNICAL MANUAL FOR TRENCHING.
2. PREVENTATIVE COATINGS SHALL BE USED TO PREVENT CORROSION OF CONCRETE AND/ OR STEEL. WHEN BEDROCK IS ENCOUNTERED IT WILL BE REMOVED BY MECHANICAL METHODS OR BLASTING. BLASTING WILL CONFORM WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.
3. PRECAUTIONS WILL BE TAKEN TO PREVENT SLOPE FAILURE WHEN WORKING WITHIN LOW STRENGTH SOILS BY FLATTENING CUT / FILL SLOPES, NOT OVERLOADING, MAINTAINING LATERAL SUPPORT, AND PREVENTING SATURATION OF SOILS. USE OF THESE SOILS WILL BE AVOIDED FOR ROADWAY CONSTRUCTION.
4. FOR SOILS PRONE TO FLOODING, SLOW PERCOLATION, PONDING WETNESS, HAVE A SEASONAL HIGH WATER TABLE, OR ARE HYDRIC, EXCAVATIONS IN SOILS THAT HAVE THESE CHARACTERISTICS WILL LIKELY ENCOUNTER WATER, DEWATER WITH APPROPRIATE MEANS SUCH AS PUMP WATER FILTER BAGS, SEDIMENT TRAPS, ETC.
5. SOILS THAT HAVE THE POTENTIAL TO SWELL, SHRINK, OR HEAVE DUE TO FROST ACTION MAY CAUSE DAMAGE TO ROADWAYS OR PADS WHERE FOUNDATIONS ARE CRITICAL REMOVAL AND REPLACEMENT OF SOILS WITH SUITABLE MATERIAL MAY BE REQUIRED.
6. IN SOILS THAT ARE A POOR SOURCE OF TOPSOIL, DROUGHTY OR PRONE TO WETNESS, SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL, WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.
7. FOR THOSE SOILS THAT ARE EASILY ERODIBLE, PROVIDE PROTECTIVE LINING, SEEDING AND MULCHING, EROSION CONTROL BLANKETS (ROLLS OR HYDRAULICALLY APPLIED), TRACKING SLOPES, UPSTREAM DIVERSIONS, WATERBARS, ETC., TO MINIMIZE EROSION OF THE SOILS.

Table 2 – Soils mapping units within the LOD

Soil Mapping Unit	Soil Series
AbB	Albrights silt loam, 3 to 8 percent slopes
LkC	Leck kill channery silt loam, 8 to 15 percent slopes
LkB	Leck kill channery silt loam, 3 to 8 percent slopes

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Albrights	AbB	X	C/S	X	X		X	X	X	X	X	X	X				X
Leck Kill	LkC, LkB	X	C						X	X	X	X	X				X

CHARACTERISTICS OF EARTH DISTURBANCE ACTIVITY, INCLUDING PAST, PRESENT AND PROPOSED LAND USE PROPOSED ALTERATIONS TO THE AREA

TRANSCO WILL BE INSTALLING A MAINLINE VALVE (MLV) NEAR THE EASTERN TERMINUS OF THE BENTON LOOP AS A MEANS TO ISOLATE GAS FLOWS. PIG LAUNCHERS/RECEIVERS WILL BE LOCATED AT THIS MLV FACILITY. ALL WORK AND DISTURBED AREAS ARE LOCATED WITHIN TRANSCO PROPERTY, EXISTING EASEMENTS, OR LEGALLY OBTAINED WORKSPACE WHERE THE PAST, PRESENT, AND PROPOSED LAND USE IS PRIMARILY AN EXISTING PIPELINE ROW. ALL DISTURBED AREAS WITHIN THE TEMPORARY WORKSPACES WILL BE RESTORED TO THE ORIGINAL CONTOURS. USING DATA TAKEN FROM GOOGLE EARTH AND MULTI–RESOLUTION LAND CHARACTERISTICS (MRLC) CONSORTIUM WEBSITE (HTTPS://WWW.MRLC.GOV/VIEWER/), MAJOR PORTION OF THE EASTERN TERMINUS SITE WAS EXISTING AND MAINTAINED GAS PIPELINE RIGHT–OF–WAY FOR THE PAST 20 YEARS AND WILL CONTINUE TO BE AN EXISTING AND MAINTAINED GAS PIPELINE RIGHT–OF–WAY ONCE THE PROJECT IS COMPLETE. ALONG THE EDGES OF THE ROW LAND USE IS PRIMARILY FORESTED. BASED ON THE SURROUNDING LAND CHARACTERISTICS, LAND USE PRIOR TO ROW CONSTRUCTION WITHIN THE PAST 50 YEARS WOULD HAVE BEEN EITHER FORESTED LAND OR MEADOW. THE PROPOSED CONSTRUCTION AT THE MLV SITE WILL CONSIST OF A GRAVEL PAD AND AN ASSOCIATED ACCESS ROAD. THE CONTRACTOR WILL CONSTRUCT STORMWATER BMPS TO MITIGATE THE INCREASE IN VOLUME AND PEAK RATES ASSOCIATED WITH CONSTRUCTION. THE PROPOSED BMPS ARE DESIGNED TO STORE THE NET INCREASE IN VOLUME BETWEEN THE PRE– AND POST–DEVELOPMENT 2–YEAR RAIN EVENTS. REFER TO THE STORMWATER BMP SIZING CALCULATIONS IN ATTACHMENT 4 FOR ADDITIONAL INFORMATION.

BMP DESCRIPTION NARRATIVE

INCREASE IN STORMWATER RUNOFF DURING AND AFTER CONSTRUCTION SHALL BE CONTROLLED BY SEQUENCING THE OPERATIONS AND USING A SELECTION OF BEST MANAGEMENT PRACTICES (BMPS). A WET DETENTION POND WILL BE UTILIZED TO CAPTURE EXCESS RUNOFF GENERATED DUE TO INCREASED IMPERVIOUS AREA. SEDIMENT BASIN USED TEMPORARILY AT THE SITE FOR E&S CONTROL WILL BE DEWATERED AND LATER CONVERTED TO THE WET POND. A DIVERSION CHANNEL WILL CONVEY RUNOFF FROM DISTURBED AREAS TO THE WET POND. ALL BMP DESIGN CALCULATIONS AND DRAWINGS ARE PROVIDED IN ATTACHMENT 4 AND PCSM PLAN SET.

BMP INSTALLATION SEQUENCE

THE PCSM BMP'S SHOULD BE INSTALLED IN THE FOLLOWING MANNER:

1. PROTECT BMP AREAS FROM COMPACTION PRIOR TO AND DURING INSTALLATION.
2. INSTALL AND MAINTAIN PROPER EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION.
3. WET DETENTION BOND WITH FOREBAY
   A. DEWATER THE SEDIMENT BASIN, FLUSH OUT THE OUTLET PIPE AND OUTLET BASIN TO CLEAN OUT EXCESS ACCUMULATED SEDIMENT.
   B. REMOVE ANY TEMPORARY RISERS FROM THE BASIN AND INSTALL PERMANENT RISERS.
   C. GRADE THE WET POND AND CONSTRUCT A FOREBAY TO TRAP SEDIMENTS CONVEYED THROUGH THE COLLECTION CHANNEL. A LOW PERMEABILITY LINER WITH 12" TOPSOIL OVER 12" COMPACTED SOIL SUBBASE WILL BE USED FOR THE WET POND BOTTOM.
   D. INSTALL SURROUNDING EMBANKMENTS, ACCESS ROAD AND OUTLET CONTROL STRUCTURES.
   E. APPLY AND GRADE PLANTING SOIL.
   F. APPLY EROSION CONTROL MEASURES.
   G. AS AREAS ARE COMPLETED, SEED, PLANT AND MULCH IN ACCORDANCE WITH THE SECTION BELOW.
   H. INSTALL ANTI–GRAZING MEASURES, IF NECESSARY.
4. SELECT PLANTS THAT ARE WELL ADAPTED TO THE SPECIFIC SITE CONDITIONS. MEADOW PLANTS MUST BE ABLE TO OUT COMPETE WEED SPECIES IN THE FIRST FEW YEARS AS THEY BECOME ESTABLISHED. WET POND BOTTOM SHALL BE REVEGETATED WITH ERNST SEEDS ERNMX–128, SEASONALLY FLOODED WILDLIFE FOOD MIX, OR APPROVED EQUAL.
5. INSTALL ANTI–GRAZING MEASURES, IF NECESSARY
6. ALL TEMPORARY E&S BMPS WILL BE REMOVED FOLLOWING SITE STABILIZATION. DO NOT REMOVE OTHER EROSION AND SEDIMENT CONTROL MEASURES UNTIL SITE IS FULLY STABILIZED.
7. FOLLOW LONG TERM OPERATION AND MAINTENANCE GUIDELINES DISCUSSED BELOW.
8. ALL INSTALLED BMPS WILL BE MONITORED UNTIL FINAL SITE STABILIZATION IS ACHIEVED.

SEEDING AND MULCHING:

THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER CONSTRUCTION IS COMPLETED. ESTABLISHMENT OF TEMPORARY COVER MUST TAKE PLACE WITHIN 4 DAYS OF CESSATION OF WORK. TEMPORARY EROSION AND SEDIMENTATION CONTROL BMPS CAN BE REMOVED WHEN THE SITE MEETS FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL–DISTURBING ACTIVITIES ARE COMPLETED, AND THAT A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT HARD COVER SUCH AS PAVEMENT OR BUILDINGS HAS STABILIZED THE SURFACE. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE. NO HAY OR STRAW MULCH SHALL BE PLACED ON WATERBODY BANKS. AT A MINIMUM, ALL WATERBODY BANKS SHALL BE COVERED WITH EROSION CONTROL BLANKET. IN ADDITION, ONLY STRAW MULCH SHALL BE USED IN AREAS ADJACENT TO WETLANDS.

TEMPORARY REVEGETATION

AFTER GRADING AND EXCAVATION IS COMPLETED WITHIN AN AREA, VEGETATION WILL BE SOWN PROMPTLY AFTER CEASING EARTHWORK IN THOSE AREAS. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL WILL BE APPLIED TO NEWLY SEEDED AREAS TO PROTECT AGAINST EROSION UNTIL THE VEGETATION IS ESTABLISHED. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL SHALL BE APPLIED AT A RATE OF AT LEAST 3 TONS PER ACRE. EROSION CONTROL BLANKET SHALL BE USED ON STREAM BANKS. NO HAY OR STRAW, MULCH OR BLANKET SHALL BE UTILIZED IN WETLAND AREAS.

PERMANENT SEEDING AND MULCHING

TOPSOIL WILL BE REPLACED PRIOR TO STABILIZATION. DISTURBED AREAS SHALL BE SEEDED WITH A MIXTURE AS OUTLINED IN THE DETAILS PAGES OF THE EROSION AND SEDIMENT CONTROL PLAN SET. APPLY LIME AND FERTILIZER IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS OR AS OUTLINED IN THE BELOW TABLE. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL SHALL BE APPLIED AT A RATE OF AT LEAST 3 TONS PER ACRE.

TABLE 11.2
Soil Amendment Application Rate Equivalents

Soil Amendment	Permanent Seeding Application Rate			Notes
	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	
Agricultural lime	6 tons	240 lb.	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-20-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields
	Temporary Seeding Application Rate			
Agricultural lime	1 ton	40 lb.	410 lb.	Typically not required for topsoil stockpiles
10-10-10 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for topsoil stockpiles

Adapted from Penn State, "Erosion Control and Conservation Plantings on Noncropland"

NOTE: A compost blanket which meets the standards of this chapter may be substituted for the soil amendments shown in Table 11.2.

TABLE 11.3
Plant Tolerances of Soil Limitation Factors

Species	Growth Habit[1]	Tolerates				Minimum Seed Specifications[3]				
		Wet Soil	Dry Site	Low Fertility	Acid Soil (pH 5-5.5)[2]	Purity (%)	Ready Germ (%)	Hard Seed (%)	Total Germ (%)	Seeds/lb (1,000s)
Warm-Season Grasses										
Deertongue	bunch	yes	yes	yes	yes	95	75		75	250
Weeping lovegrass	bunch	no	yes	yes	yes	97	75		75	1,500
Switchgrass[5]	bunch	yes	yes	yes	yes		(60 PLS)			390
Big bluestem	bunch	no	yes	yes	yes		(60 PLS)			150
Cool-Season Grasses										
Tall Fescue	bunch	yes	no	yes	no	95	80		80	227
Redtop	sod	yes	yes	yes	yes	92	80		80	5,000
Fine fescues	sod	no	no	yes	no	95	80		80	400
Perennial ryegrass	bunch	yes	no	no	no	95	85		85	227
Annual ryegrass	bunch	yes	no	yes	no	95	85		85	227
Kentucky bluegrass	sod	no	no	no	no	85	75		75	2,200
Reed canarygrass	sod	yes	yes	yes	no	95	70		70	520
Orchardgrass	bunch	yes	yes	yes	yes	95	80		80	654
Timothy	bunch	yes	no	yes	yes	95	80		80	1,230
Smooth bromegrass	sod	no	yes	yes	no	95	80		80	136
Legumes[6]										
Birdsfoot trefoil[7]	bunch	yes	no	yes	yes	98	60	20	80	400
Flatpea	sod	no	no	yes	yes	98	55	20	75	10
Serecia lespedeza	bunch	no	yes	yes	yes	98	60	20	80	335
Cereals										
Winter wheat	bunch	no	no	no	no	98	85		85	15
Winter rye	bunch	no	no	yes	yes	98	85		85	18
Spring oats	bunch	no	no	no	no	98	85		85	13
Sundangrass	bunch	no	yes	no	no	98	85		85	55
Japanese millet	bunch	yes	no	yes	yes	98	80		80	155

[1] Growth habit refers to the ability of the species to either form a dense sod by vegetative means (stolons, rhizomes, or roots) or remain in a bunch or single plant form. If seeded heavily enough, even bunch formers can produce a very dense stand. This is sometimes called a sod, but not in the sense of a sod formed by vegetative means.

[2] Once established, plants may grow at a somewhat lower pH, but cover generally is only adequate at pH 6.0 or above.

[3] *Minimum seed lots are truly minimum, and seed lots to be used for revegetation purposes should equal or exceed these standards.* Thus, deertongue grass should germinate 75% or better. Crownvetch should have at least 40% readily germinable seed and 30% hard seed. Commonly, seed lots are available that equal or exceed minimum specifications. Remember that disturbed sites are adverse for plant establishment. Ready germination refers to seed that germinates during the period of the germination test and that would be expected, if conditions are favorable, to germinate rapidly when planted. The opposite of ready germination is dormant seed, of which hard seed is one type.

[4] Switchgrass seed is sold only on the basis of PLS.

[5] Need specific legume inoculant. Inoculant suitable for garden peas and sweetpeas usually is satisfactory for flatpea.

[6] Birdsfoot trefoil is adapted over the entire state, except in the extreme southeast where crown and root rots may injure stands.

Penn State, "Erosion Control and Conservation Plantings on Noncropland,"

TABLE 11.4
Recommended Seed Mixtures

Mixture Number	Species	Seeding Rate - Pure Live Seed[1]	
		Most Sites	Adverse Sites
1[2]	Spring oats (spring), or Annual ryegrass (spring or fall), or Winter wheat (fall), or Winter rye (fall)	64 10 90 56	96 15 120 112
2[3]	Tall fescue, or Fine fescue, or Kentucky bluegrass, plus Redtop[4], or Perennial ryegrass	60 35 25 3 15	75 40 30 3 20
3	Birdsfoot trefoil, plus Tall fescue	6 30	10 35
4	Birdsfoot trefoil, plus Reed canarygrass	6 10	10 15
8	Flatpea, plus Tall fescue, or Perennial ryegrass	20 20 20	30 30 25
9[6]	Serecia lespedeza, plus Tall fescue, plus Redtop[4]	10 20 3	20 25 3
10	Tall fescue, plus Fine fescue	40 10	60 15
11	Deertongue, plus Birdsfoot trefoil	15 6	20 10
12[7]	Switchgrass, or Big Bluestem, plus Birdsfoot trefoil	15 15 6	20 20 10
13	Orchardgrass, or Smooth bromegrass, plus Birdsfoot trefoil	20 25 6	30 35 10

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. PLS is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds PLS shown on the seed tag. Thus, if the PLS content of a given seed lot is 35%, divide 12 PLS by 0.35 to obtain 34.3 pounds of seed required to plant one acre. All mixtures in this table are shown in terms of PLS.
2. If high-quality seed is used, for most sites seed spring oats at a rate of 2 bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at 1 bushel per acre. If germination is below 90%, increase these suggested seeding rates by 0.5 bushel per acre.
3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.
4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.
5. Use for highway slopes and similar sites where the desired species after establishment is crownvetch.
6. Use only in extreme southeastern or extreme southwestern Pennsylvania. *Serecia lespedeza* is not well adapted to most of PA.
7. Do not mow shorter than 9 to 10 inches.
8. Seed mixtures containing crown vetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

PCSM CRITICAL STAGES

A SCHEDULE OF VISITS FOR THE LICENSED PROFESSIONAL OR DELEGATE IS PROVIDED BELOW. CRITICAL POINTS WHICH WILL REQUIRE VISITS AT A MINIMUM ARE LISTED AS FOLLOWS:

1. FOR THE FINAL GRADING OF THE WET POND, FOREBAY, ACCESS ROAD AND OUTLET STRUCTURES, ENSURING IT IS CONSTRUCTED ACCORDING TO THE PLAN DETAILS FOR PROPER CONVEYANCE OF RUNOFF.
2. FOR THE LAYOUT AND EXCAVATION OF THE OUTLET STRUCTURES, AND CONSTRUCTION PROCEDURES ARE FOLLOWED TO ENABLE PROPER STORAGE AND DISCHARGE TO THE POND/BASIN.
3. FOR FINAL INSPECTION OF BMPS.
4. AT THE ESTABLISHMENT OF 70% VEGETATION COVERS TO ALLOW REMOVAL OF E&S CONTROLS.

LONG TERM OPERATION AND MAINTENANCE SCHEDULE

ALL BMPS SHOULD BE PROPERLY MAINTAINED TO ENSURE THEIR EFFECTIVENESS. SHEET FLOW CONDITIONS AND INFILTRATION MUST BE SUSTAINED THROUGHOUT THE LIFE OF THE BMP. INSPECT BMPS FOR CLOGGING FROM SEDIMENT OF DEBRIS, DAMAGE BY FOOT OR VEHICULAR TRAFFIC, AND FLOW CHANNELIZATION. INSPECTIONS SHOULD BE MADE ON A QUARTERLY BASIS FOR THE FIRST TWO YEARS FOLLOWING INSTALLATION, AND THEN TWICE PER YEAR THEREAFTER. INSPECTIONS SHOULD ALSO BE MADE AFTER EVERY STORM EVENT GREATER THAN 1 INCH DURING THE ESTABLISHMENT PERIOD.

OPERATION AND MAINTENANCE GUIDELINES SHOULD BE PROVIDED TO ALL FACILITY OWNERS AND TENANTS. SEDIMENT AND DEBRIS SHOULD BE ROUTINELY REMOVED UPON OBSERVATION. IF EROSION IS OBSERVED, MEASURES SHOULD BE TAKEN TO IMPROVE DISPERSION METHOD TO ADDRESS THE SOURCE OF EROSION. SEDIMENT SHOULD BE REMOVED WHEN THE BMP IS THOROUGHLY DRY. TRASH AND DEBRIS REMOVED FROM THE SITE SHOULD BE DEPOSITED ONLY AT SUITABLE DISPOSAL/RECYCLING SITES AND MUST COMPLY WITH APPLICABLE LOCAL, STATE, AND FEDERAL WASTE REGULATIONS. GRASS COVER SHOULD BE MOWED WITH LOW GROUND PRESSURE EQUIPMENT AS NEEDED TO CONTROL NOXIOUS WEEDS. MOWING SHOULD BE DONE ONLY WHEN THE SOIL IS DRY IN ORDER TO PREVENT TRACKING DAMAGE TO VEGETATION, SOIL COMPACTION, AND FLOW CONCENTRATIONS. IF VEGETATIVE COVER IS NOT FULLY ESTABLISHED WITHIN THE DESIGNATED TIME, IT SHOULD BE REPLACED WITH AN ALTERNATIVE SPECIES. UNWANTED OR INVASIVE GROWTH SHOULD BE REMOVED ON AN ANNUAL BASIS.

DURING THE FIRST GROWING SEASON OR UNTIL ESTABLISHED, WET POND VEGETATION SHOULD BE INSPECTED EVERY 2 TO 3 WEEKS. WET PONDS SHOULD BE INSPECTED AT LEAST 4 TIMES PER YEAR AND AFTER MAJOR STORMS (GREATER THAN 2 INCHES IN 24 HOURS) OR RAPID ICE BREAKUP. INSPECTIONS SHOULD ACCESS THE VEGETATION, EROSION, FLOW CHANNELIZATION, BANK STABILITY, INLET/OUTLET CONDITIONS, EMBANKMENT AND SEDIMENT/DEBRIS ACCUMULATION. POND DRAINS SHOULD BE INSPECTED AND TESTED 4 TIMES PER YEAR.

CHANNEL LININGS WILL BE INSPECTED FOR SIGNS OF EROSION OR DISLODGING, AS APPLICABLE. CHANNELS WILL BE INSPECTED FOR DEBRIS, OVERGROWN VEGETATION, AND OTHER BLOCKAGES. VEGETATED AREAS WILL BE INSPECTED WEEKLY AND AFTER RUNOFF EVENTS UNTIL PERMANENT VEGETATION IS ACHIEVED. ONCE THE VEGETATION IS ESTABLISHED, INSPECTIONS OF HEALTH, DIVERSITY, AND DENSITY SHOULD BE PERFORMED AT LEAST TWICE PER YEAR, DURING BOTH THE GROWING AND NON–GROWING SEASON. VEGETATIVE COVER SHOULD BE SUSTAINED AT 85% AND REESTABLISHED IF DAMAGE GREATER THAN 50% IS OBSERVED. DAMAGED BMPS WILL BE REPAIRED AS SOON AS POSSIBLE UPON DISCOVERY. REPAIRS WILL BE MADE TO RESTORE TO BMPS TO THE ORIGINAL DESIGN CONDITION.

MATERIAL RECYCLING AND DISPOSAL

IF THE SITE WILL NEED TO HAVE FILL IMPORTED FROM AN OFF–SITE LOCATION, THE RESPONSIBILITY FOR PERFORMING ENVIRONMENTAL DUE DILIGENCE AND THE DETERMINATION OF CLEAN FILL WILL IN MOST CASES RESIDE WITH THE OPERATOR.

IF THE SITE WILL HAVE EXCESS FILL THAT WILL NEED TO BE EXPORTED TO AN OFF–SITE LOCATION, THE RESPONSIBILITY OF CLEAN FILL DETERMINATION AND ENVIRONMENTAL DUE DILIGENCE RESTS ON THE APPLICANT.

IF ALL CUT AND FILL MATERIALS WILL BE USED ON THE SITE, A CLEAN FILL DETERMINATION IS NOT REQUIRED BY THE OPERATOR UNLESS THERE IS A BELIEF THAT A SPILL OR RELEASE OF A REGULATED SUBSTANCE OCCURRED ON SITE.

APPLICANTS AND/OR OPERATORS MUST USE ENVIRONMENTAL DUE DILIGENCE TO ENSURE THAT THE FILL MATERIAL ASSOCIATED WITH THIS PROJECT QUALIFIES AS CLEAN FILL. DEFINITIONS OF CLEAN FILL AND ENVIRONMENTAL DUE DILIGENCE ARE PROVIDED BELOW. ALL FILL MATERIAL MUST BE USED IN ACCORDANCE WITH THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL", DOCUMENT NUMBER 258 2182 773. A COPY OF THIS POLICY IS AVAILABLE ONLINE AT WWW.DEPWEB.STATE.PA.US.

CLEAN FILL IS DEFINED AS: UNCONTAMINATED, NON–WATER SOLUBLE, NON–DECOMPOSABLE, INERT, SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED. (THE TERM "USED ASPHALT" DOES NOT INCLUDE MILLED ASPHALT OR ASPHALT THAT HAS BEEN PROCESSED FOR RE–USE.).

ENVIRONMENTAL DUE DILIGENCE: INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF PROPERTY OWNERSHIP, REVIEW OF PROPERTY USE HISTORY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS. ANALYTICAL TESTING IS NOT A REQUIRED PART OF DUE DILIGENCE UNLESS VISUAL INSPECTION AND/OR REVIEW OF THE PAST LAND USE OF THE PROPERTY INDICATES THAT THE FILL MAY HAVE BEEN SUBJECTED TO A SPILL OR RELEASE OF REGULATED SUBSTANCE. IF THE FILL MAY HAVE BEEN AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE, IT MUST BE TESTED TO DETERMINE IF IT QUALIFIES AS CLEAN FILL. TESTING SHOULD BE PERFORMED IN ACCORDANCE WITH APPENDIX A OF THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL".

FILL MATERIAL THAT DOES NOT QUALIFY AS CLEAN FILL IS REGULATED FILL. REGULATED FILL IS WASTE AND MUST BE MANAGED IN ACCORDANCE WITH THE DEPARTMENT'S MUNICIPAL OR RESIDUAL WASTE REGULATIONS BASED ON 25 PA. CODE CHAPTERS 287 RESIDUAL WASTE MANAGEMENT OR 271 MUNICIPAL WASTE MANAGEMENT, WHICHEVER IS APPLICABLE.

THERMAL IMPACTS

DUE TO THE OVERALL NATURE OF THE PROJECT, THERMAL IMPACTS TO SURFACE WATERS ARE NOT ANTICIPATED. THE PIPELINE INSTALLATION ACTIVITIES WILL PRIMARILY TAKE PLACE WITHIN AN EXISTING CLEARED AND MAINTAINED PIPELINE RIGHT–OF–WAY. THERE WILL BE NO INCREASE IN STORMWATER DISCHARGE. THE PRIMARY MEANS TO ADDRESS THERMAL IMPACTS ON THIS PROJECT IS TO LIMIT THE SIZE AND DURATION OF EXPOSED EARTH. REVEGETATION PROCEDURES AND THE SEQUENCE OF CONSTRUCTION OUTLINE DISTURBED AREAS BEING IMMEDIATELY REVEGETATED.

STORMWATER RUNOFF ASSOCIATED WITH THE INSTALLATION OF THE MLV WILL BE ROUTED THROUGH THE STORMWATER BMP'S DESIGNED TO RETAIN THE FIRST SURGE OF WATER FROM THE SITE. THE FIRST SURGE OF WATER WILL BE THE WARMEST WATER FOR THE DURATION OF THE STORM EVENT AND WILL QUICKLY COOL AS THE STORM EVENT PROGRESSES. THE BMPS ARE DESIGNED TO CAPTURE THIS WARMEST SURGE OF STORMWATER. BASED ON ROUTING CALCULATIONS, STORMWATER IS NOT DISCHARGED FROM THE BMPS FOR THE FIRST 12 HOURS DURING A 100–YEAR/24–HOUR STORM EVENT. THE RETENTION PERIOD IS LONGER FOR LESS INTENSE STORMS. THEREFORE, THROUGH THESE MEASURES, THERE IS NO SIGNIFICANT THERMAL IMPACT TO THE RECEIVING WATERS ANTICIPATED.

THESE PLANS AND NARRATIVE WERE PREPARED BY BY KEVIN C. CLARK, PE (BAI GROUP, LLC) OF STATE COLLEGE, PA IN ACCORDANCE WITH THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION STORMWATER BMP MANUAL, DECEMBER, 2006. THE PLAN PREPARER'S RESUME IS PROVIDED IN THE PERMIT APPLICATION).

NON–STRUCTURAL AND STRUCTURAL WATER QUALITY BMP DESCRIPTION

1. LIMIT OF DISTURBANCE WILL BE MINIMIZED TO THE MAXIMUM EXTENT POSSIBLE BY DISTURBING ONLY THOSE AREAS NECESSARY TO COMPLETE THE PROPOSED EARTHWORK AND BMP INSTALLATIONS.
2. SENSITIVE FEATURES SUCH AS WETLANDS WILL BE PROTECTED TO THE MAXIMUM EXTENT POSSIBLE. THESE AREAS WILL BE CLEARLY DELINEATED IN THE FIELD AND PROTECTED PRIOR TO ANY CONSTRUCTION ACTIVITIES TAKING PLACE. EXISTING VEGETATION IS NOT TO BE REMOVED FROM THE PROTECTED AREA AND THE AREAS SHALL NOT BE SUBJECT TO GRADING OR MOVEMENT OF EXISTING SOILS. ANY PROTECTED AREAS THAT HAVE BEEN DISTURBED/COMPACTED DURING CONSTRUCTION WILL BE RESTORED USING SOIL AMENDMENT AND RESTORATION.
3. DISTURBED AREAS THAT ARE NOT PROPOSED TO BE IMPERVIOUS WILL BE REVEGETATED AS PER THE SEEDING AND MULCHING NOTES PROVIDED IN PCSM PLAN NOTES.
4. AT THE EASTERN TERMINUS VALVE YARD SITE, WET DETENTION POND WILL ACT AS A WATER QUALITY BMP. WHEREVER POSSIBLE, EXISTING NATURAL DRAINAGE PATTERNS WILL BE UTILIZED TO DIVERT FLOW TO THE PROPOSED WET POND. RELATIVELY STEEPER SLOPES ARE UTILIZED FOR THE WET POND EMBANKMENTS TO MINIMIZE DISTURBANCE TO EXISTING STREAMS AND WETLANDS.

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
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041211-E

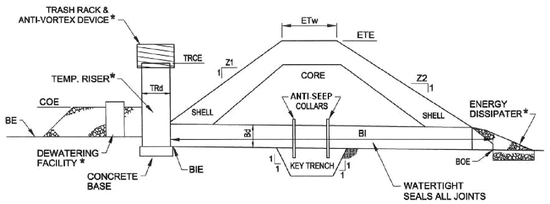
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05-04-20	RHM	UPDATED PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - BENTON LOOP
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
EASTERN TERMINUS MAIN LINE VALVE
NOTES
JORDAN TOWNSHIP, LYCOMING COUNTY, PENNSYLVANIA

DRAWN BY: SWH	DATE: 3/22/19	ISSUED FOR BID:	SCALE:
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 4
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 6



BASIN NO.	Z1 (FT)	Z2 (FT)	TEMPORARY RISER			BARREL				
			DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	DIA Bd (IN)	INLEY ELEV BIE (FT)	MAT'L	LENGTH (FT)	OUTLET ELEV BOE (FT)
1	3	2	20	1248.5	CMP	15	1245.0	CMP	43	1243.0

EMBANKMENT				CLEANOUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
TOP ELEV ETE (FT)	TOP WIDTH ETw (FT)	KEY TRENCH DEPTH (FT)	KEY TRENCH WIDTH (FT)		
1251.0	8	2	4	1245.0	1242.5

NOTES:

*ALSO REFER TO SEDIMENT BASIN TEMPORARY RISER, EMERGENCY SPILLWAY, ENERGY DISSIPATER, TRASH RACK AND ANTI–VORTEX DEVICE, AND SEDIMENT STORAGE DEWATERING FACILITY DETAILS.

SEDIMENT BASINS, INCLUDING ALL APPURTENANT WORKS, SHALL BE CONSTRUCTED TO THE DETAIL AND DIMENSIONS SHOWN ON THE E&S PLAN DRAWINGS.

AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO A DEPTH OF TWO FEET PRIOR TO ANY PLACEMENT AND COMPACTION OF EARTHEN FILL. FILL MATERIAL FOR THE EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIALS. THE EMBANKMENT SHALL BE COMPACTED IN LAYERED LIFTS OF NOT MORE THAN 6" TO 9". THE MAXIMUM ROCK SIZE SHALL BE NO GREATER THAN ⅔ THE LIFT THICKNESS. UPON COMPLETION, THE EMBANKMENT SHALL BE SEEDED AND MULCHED OR OTHERWISE STABILIZED ACCORDING TO THE SPECIFICATIONS OF THE E&S PLAN DRAWINGS. TREES SHALL NOT BE PLANTED ON THE EMBANKMENT.

ACCESS SHALL BE PROVIDED FOR SEDIMENT REMOVAL AND OTHER REQUIRED MAINTENANCE ACTIVITIES.

A CLEAN OUT STAKE SHALL BE PLACED NEAR THE CENTER OF EACH BASIN. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT HAS REACHED THE CLEAN OUT ELEVATION ON THE STAKE AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS. DISPOSE OF MATERIALS REMOVED FROM THE BASIN IN THE MANNER DESCRIBED IN THE E&S PLAN.

WET POND SHOULD BE INSPECTED AT LEAST 4 TIMES PER YEAR AND AFTER MAJOR STORMS (> 2 INCHES PER 24 HOURS) OR RAPID ICE BREAKUP. THE POND DRAIN SHOULD BE INSPECTED AND TESTED 4 TIMES PER YEAR.

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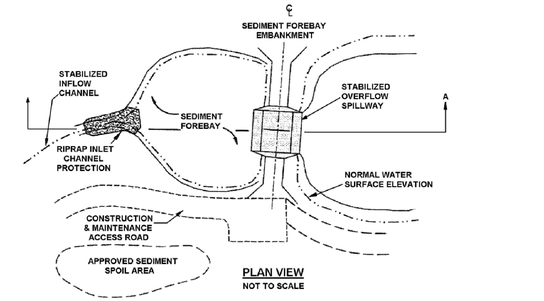
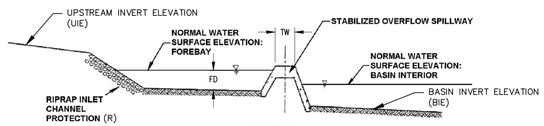
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

WPE — WET POND EMBANKMENT AND SPILLWAY DETAILS – PERFORATED RISER

Williams



PLAN VIEW
NOT TO SCALE



SECTION A-A
NOT TO SCALE

NOTES:

THE OVERFLOW SPILLWAY OF A FOREBAY SHOULD NOT BE A FLOW–THROUGH SPILLWAY. THE BERM SHOULD BE CONSTRUCTED OF NON–PERMEABLE SOILS OR CONCRETE. WHERE SOILS ARE USED, A SUITABLE TYPE OF HARD ARMOR SHOULD BE PROVIDED TO PREVENT SCOUR DURING OVERFLOW.

WHERE NEEDED, FOREBAY EFFICIENCY CAN OFTEN BE INCREASED BY THE PROPER USE OF FLOCCULANTS. MANUFACTURER'S RECOMMENDATIONS SHOULD BE STRICTLY FOLLOWED TO MAXIMIZE EFFICIENCY OF THE FLOCCULANT AND PREVENT CHEMICAL CONTAMINATION.

SEDIMENT FOREBAY DEPTH(FT), (FD)	FOREBAY SPILLWAY TOP WIDTH(FT) (TW)	RIPRAP INLET ROCK SIZE(IN) (R)	RIPRAP INLET THICKNESS(IN)	UPSTREAM INVERT(FT) (UIE)	BASIN INVERT (BIE)
4	2	3	9	1251.0	1242.5

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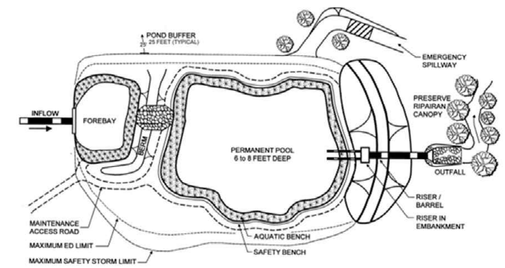
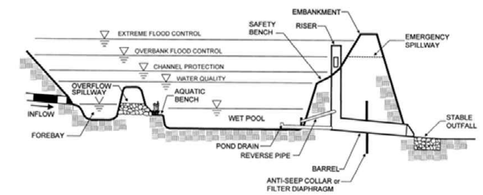
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

SF — TYPICAL SEDIMENT FOREBAY

Williams



PLAN VIEW



PROFILE

SEDIMENT BASIN/WET POND SCHEDULE								
BASE ELEVATION [FT]	TOP ELEVATION [FT]	INSIDE SLOPE	OUTSIDE SLOPE	BASE WIDTH [FT]	BASE LENGTH [FT]	TOTAL DEPTH [FT]	SHWT (INCHES BELOW GROUND)	BED ROCK (INCHES BELOW GROUND)
1242.5	1250	3	2	24	94	7.5	Not Encountered	Not Encountered

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

WDP — WET DETENTION POND WITH FOREBAY

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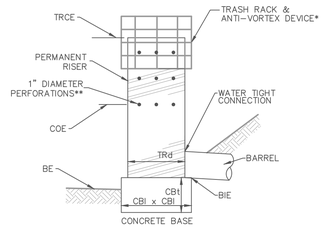

* SEE STANDARD CONSTRUCTION DETAIL #7–5, TRASH RACK AND ANTI–VORTEX DEVICE
** LOWEST ROW OF HOLES AT SEDIMENT CLEAN–OUT ELEVATION

BASIN NO.	PERMANENT RISER			PERFORATIONS				CONCRETE BASE		BARREL
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	LOWEST ROW OF HOLES ELEV (FT)	NO. ROWS**	NO. HOLES PER ROW	VERT. SPACING OF ROWS (FT)	LENGTH AND WIDTH CBl (IN)	THICKNESS CBt (IN)	INLET ELEV BIE (FT)
1	20	1248.5	CMP	1245.0	3	3	1	40	12	1245.0

NOTES:

*SEE STANDARD CONSTRUCTION DETAIL #7–5, TRASH RACK AND ANTI–VORTEX DEVICE
**LOWEST ROW OF HOLES AT SEDIMENT CLEAN–OUT ELEVATION.

A MINIMUM 2 #8 REBAR SHALL BE PLACED AT RIGHT ANGLES AND PROJECTING THROUGH SIDES OF RISER TO ANCHOR IT TO CONCRETE BASE. REBAR SHALL PROJECT A MINIMUM OF ¼ RISER DIAMETER BEYOND OUTSIDE OF RISER.

CONCRETE BASE SHALL BE POURED IN SUCH A MANNER SO AS TO INSURE THAT CONCRETE FILLS BOTTOM OF RISER TO INVERT OF THE OUTLET PIPE TO PREVENT RISER FROM BREAKING AWAY FROM THE BASE. MINIMUM BASE WIDTH EQUALS 2 TIMES RISER DIAMETER.

EMBEDDED SECTION OF ALUMINUM OR ALUMINIZED PIPE SHALL BE PAINTED WITH ZINC CHROMATE OR EQUIVALENT.

CLOGGED OR DAMAGED SPILLWAYS SHALL BE REPAIRED IMMEDIATELY. TRASH AND OTHER DEBRIS SHALL BE REMOVED FROM THE BASIN AND RISER.

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

WP–2 — WET POND PERMANENT RISER

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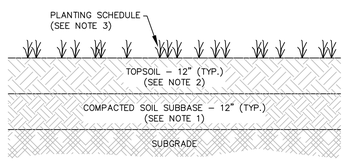

WET POND LINER NOTES

1. COMPACTED SOIL SUBBASE SHALL HAVE A MINIMUM COEFFICIENT PERMEABILITY (k) OF 1x10–5 CM/S. SOIL TYPES PERMITTED FOR USE INCLUDE GM, SM, ML, GC, CL. SUBSOIL MATERIAL SHALL BE FREE FROM HARD CLODS, STIFF CLAY, HARDPAN, ASHES, SLAG, CONSTRUCTION, DEBRIS, PETROLEUM HYDROCARBONS, OR OTHER UNDESIRABLE MATERIAL. SUBSOIL MUST NOT BE DELIVERED OR PLACED IN A FROZEN OR MUDDY STATE. COMPACTED SOIL SUBBASE MATERIAL SHALL BE PLACED ON THE BOTTOM AND INTERIOR SIDES OF THE BASIN TO THE TOP OF BERM ELEVATION. COMPACTION EFFORT SHALL BE 95% MODIFIED PROCTOR (ASTM D1557).

2. TOPSOIL SHALL MEET THE FOLLOWING REQUIREMENTS:

   A. USE A MINIMUM OF 12 INCHES OF TOPSOIL IN THE EMERGENT VEGETATION ZONE (LESS THAN 18" DEEP) OF THE POND. IF NATURAL TOPSOIL FROM THE SITE IS TO BE USED IT MUST HAVE AT LEAST 8 PERCENT ORGANIC CARBON CONTENT (BY WEIGHT) IN THE A–HORIZON FOR SANDY SOILS AND 12% FOR OTHER SOIL TYPES.
   B. IF PLANTING SOIL IS BEING IMPORTED IT SHOULD BE MADE UP OF EQUIVALENT PROPORTIONS OF ORGANIC AND MINERAL MATERIALS.
   C. LIME SHOULD NOT BE ADDED TO PLANTING SOIL UNLESS ABSOLUTELY NECESSARY AS IT MAY ENCOURAGE THE PROPAGATION OF INVASIVE SPECIES.
   D. THE FINAL ELEVATIONS AND HYDROLOGY OF THE VEGETATIVE ZONES SHOULD BE EVALUATED PRIOR TO PLANTING TO DETERMINE IF GRADING OR PLANTING CHANGES ARE REQUIRED.

3. WET POND BOTTOM SHALL BE REVEGETATED WITH ERNST SEEDS ERNMX–128, SEASONALLY FLOODED WILDLIFE FOOD MIX, OR APPROVED EQUAL. SEE BELOW FOR MIX COMPOSITION AND SEEDING RATE.

ERNST SEEDS – SEASONALLY FLOODED WILDLIFE FOOD MIX – ERNMX–128

MIX COMPOSITION
21.5% PANICUM CLANDESTINUM, TIOGA (DEERTONGUE, TIOGA)
20.0% ELYMUS VIRGINICUS, PA ECOTYPE (VIRGINIA WILDRYE, PA ECOTYPE)
16.6% ANDROPOGON GERARDII, 'NIAGARA' (BIG BLUESTEM, 'NIAGARA')
15.0% ECHINOCHLOA CRUSGALLI VAR. FRUMENTACEA (JAPANESE MILLET)
10.0% CAREX VULPINOIDEA, PA ECOTYPE (FOX SEDGE, PA ECOTYPE)
8.0% PANICUM VIRGATUM, 'CAVE–IN–ROCK' (SWITCHGRASS, 'CAVE–IN–ROCK')
4.0% CHAMAECRISTA FASCICULATA, PA ECOTYPE (PARTRIDGE PEA, PA ECOTYPE)
1.5% VERBENA HASTATA, PA ECOTYPE (BLUE VERVAIN, PA ECOTYPE)
1.0% HELIOPSIS HELIANTHOIDES, PA ECOTYPE (OXEYE SUNFLOWER, PA ECOTYPE)
1.0% JUNCUS EFFUSUS (SOFT RUSH)
0.8% AGROSTIS PERENNANS, ALBANY PINE BUSH–NY ECOTYPE (AUTUMN BENTGRASS, ALBANY PINE BUSH–NY ECOTYPE)
0.1% ASCLEPIAS INCARNATA, PA ECOTYPE (SWAMP MILKWEED, PA ECOTYPE)
0.1% ASTER NOVAE–ANGLIAE, PA ECOTYPE (NEW ENGLAND ASTER, PA ECOTYPE)
0.1% EUPATORIUM FISTULOSUM, PA ECOTYPE (JOE PYE WEED, PA ECOTYPE)
0.1% EUPATORIUM PERFOLIATUM, PA ECOTYPE (BONESET, PA ECOTYPE)
0.1% MONARDA FISTULOSA, FORT INDIANTOWN GAP–PA ECOTYPE (WILD BERGAMOT, FORT INDIANTOWN GAP–PA ECOTYPE)
0.1% PYCNANTHEMUM TENUIFOLIUM (NARROWLEAF MOUNTAINMINT)

SEEDING RATE: 20 LB PER ACRE, OR 1/2 LB PER 1,000 SQ FT

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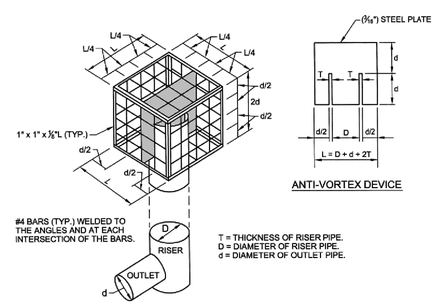
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

WET POND LINING DETAIL



RISER DIAMETER (IN)	OUTLET PIPE DIAMETER (IN) (D)	RISER PIPE THICKNESS (IN) (T)	RISER PIPE THICKNESS (IN) (L)
20	15	0.079	36

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

TR — TRASH RACK AND ANTI–VORTEX DEVICE

Williams

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WHM designs, permits, resolutions consulting, INC.

BA GROUP

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - BENTON LOOP
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
EASTERN TERMINUS MAIN LINE VALVE
DETAILS SHEET 1
JORDAN TOWNSHIP, LYCOMING COUNTY, PENNSYLVANIA

Williams

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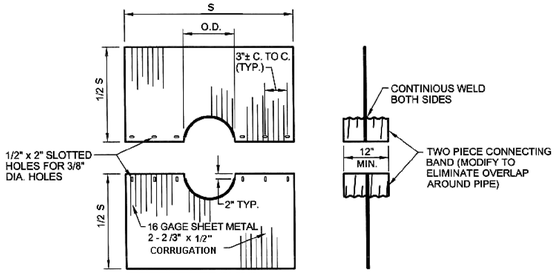
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 6



NOTES:

COLLAR SHALL BE OF SAME GAGE AND WITH SAME COATING AS PIPE WITH WHICH IT IS USED. INSTALL WITH CORRUGATIONS VERTICAL.

MINIMUM DISTANCE TO PIPE JOINT SHALL BE 2 FEET.

ALL COLLARS SHALL BE INSTALLED SO AS TO BE WATERTIGHT. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.

COLLAR SIZE AND SPACING SHALL BE AS INDICATED BELOW:

BASIN OR TRAP NO.	PIPE SIZE (IN)	S (IN)	NO. OF COLLARS	RISER TO FIRST COLLAR (FT)	COLLAR SPACING (FT)
1	15	42	2	5	8

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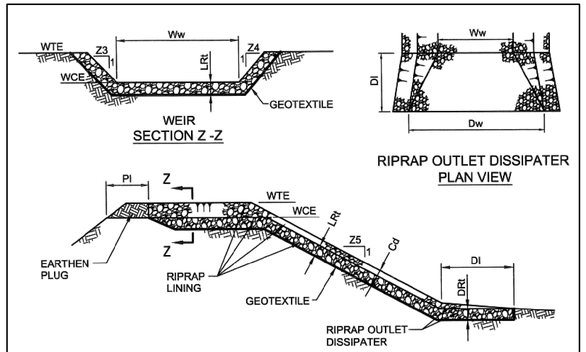
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

C — METAL ANTI-SEEP COLLAR FOR TEMPORARY BASINS OR TRAPS

Williams.



EMBANKMENT SECTION ALONG EMERGENCY SPILLWAY

BASIN NO.	WEIR					LINING		CHANNEL		DISSIPATOR			
	Z3 (FT)	Z4 (FT)	TOP ELEV. WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. LRt (IN)	Z5 (FT)	DEPTH Cd (FT)	LENGTH DI (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. DRt (IN)
1	3	3	1251.0	1248.5	10	3	6	2	1	15	6	3	12

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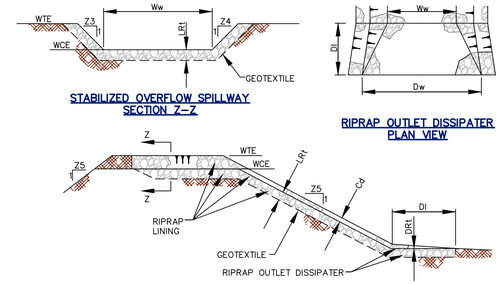
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

WP-1 — WET POND EMERGENCY SPILLWAY WITH RIPRAP LINING

Williams.



STABILIZED OVERFLOW SPILLWAY

PA DEP

BASIN NO.	WEIR					LINING		CHANNEL		DISSIPATER			
	Z3 (FT)	Z4 (FT)	TOP ELEV. WTE (FT)	CREST ELEV. WCE (FT)	WIDTH Ww (FT)	RIPRAP SIZE (R-?)	RIPRAP THICK LRt (IN)	Z5 (FT)	DEPTH Cd (FT)	LENGTH DI (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R-?)	RIPRAP THICK DRt (IN)
1	3	3	1246.5	1244.5	4	3	9	2	0.5	6	18	3	9

DIMENSION PI SHALL BE 5' MINIMUM.

DISPLACED RIPRAP WITHIN THE SPILLWAY AND/OR OUTLET CHANNEL SHALL BE REPLACED IMMEDIATELY.

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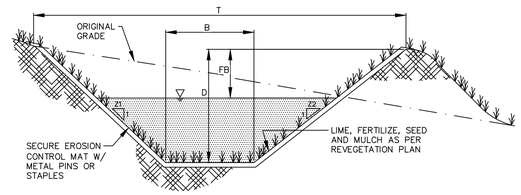
STANDARD ENVIRONMENTAL DETAIL

FE-1 — FOREBAY EMERGENCY SPILLWAY

Williams.



CHANNEL ID	LENGTH (FT)	SLOPE (%)	BASE WIDTH (FT)	DEPTH (FT)	SIDE SLOPES (Z1/Z2)	TOP WIDTH (FT)	LINING	OUTLET
DC-BL-4	226	0.052	3	1.00	2/1	7.00	R-3 LINING	WET POND

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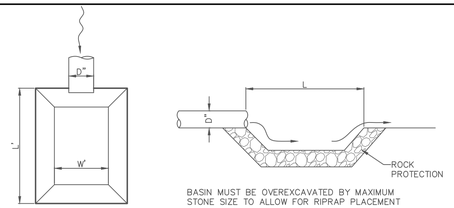
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

DC — TYPICAL DIVERSION CHANNEL (GRASS-LINED)

Williams.



BASIN MUST BE OVEREXCAVATED BY MAXIMUM STONE SIZE TO ALLOW FOR RIPRAP PLACEMENT

NOTES:

ALL OUTLET BASINS SHALL BE INSPECTED ON AT LEAST A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT.

DISPLACED RIPRAP WITHIN THE OUTLET BASIN SHALL BE REPLACED IMMEDIATELY.

SIDE SLOPES SHALL NOT EXCEED 1.5X:1V

ID	PIPE DIAMETER, D (IN)	FLOW, Q (CFS)	OUTLET BASIN WIDTH, W (FT)	OUTLET BASIN LENGTH, L (FT)	OUTLET BASIN DEPTH (FT)	RIPRAP ROCK SIZE	ROCK THICKNESS (IN)
WET POND OUTLET	15	0	3.75	7.50	1.00	R-3	9

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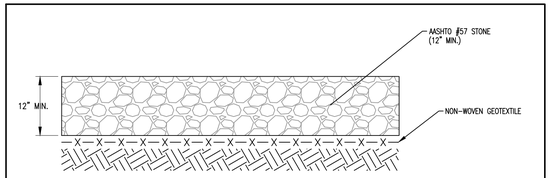
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

OB — OUTLET BASIN DETAIL

Williams.



NOTES:

1. CROSS SECTION TO BE APPLIED TO DRY AREAS WITHOUT DRAINAGE CONCERNS.
2. EXISTING MATERIAL TO BE REMOVED AND STOCKPILED IN AN APPROVED LOCATION ONLY.
3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

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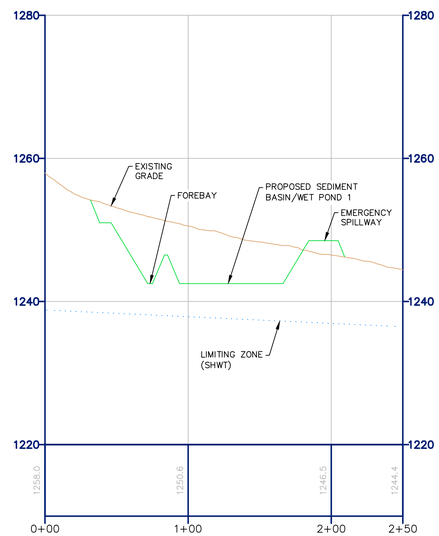
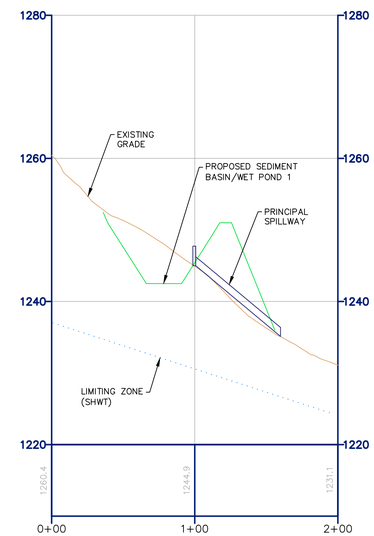
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

MLV-P — MAIN LINE VALVE PAD



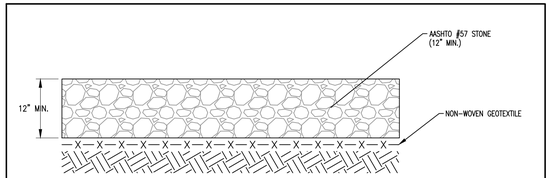
SECTION A-A' SEDIMENT BASIN/WET POND 1

HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'



SECTION B-B' SEDIMENT BASIN/WET POND 1

HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'



NOTES:

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3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

AR — PERMANENT/TEMPORARY STONE ACCESS ROAD

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05-04-20	RHM	UPDATED PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - BENTON LOOP
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
EASTERN TERMINUS MAIN LINE VALVE
DETAILS SHEET 2
JORDAN TOWNSHIP, LYCOMING COUNTY, PENNSYLVANIA

Williams.

DRAWN BY: SWH	DATE: 3/22/19	ISSUED FOR BID:	SCALE:
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 6 OF 6
WO: 1211227	RID:		

WHM consulting, INC. designs, permits, resolutions

BA GROUP

Transcontinental Gas Pipe Line Company, LLC

Section 3-2 PCSM Plan for Benton Loop

Leidy South Project – Benton Loop

Eastern Terminus Main Line Valve and Access Road

September 2019
(Revised May 2020)

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3.0 Receiving Surface Waters (NOI Checklist Item 7.e)

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- 4.1 Resolutions to Soil Limitations
- 4.2 Geologic Formations

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 7.c)

6.0 Post-Construction Stormwater Management Best Management Practices, Installation Sequence and PCSM Critical Stages (NOI Checklist Item 7.f, 7.g) *(Revised May 2020)*

7.0 Net Change in Volume and Rate of Runoff (NOI Checklist Item 7.d, 8.b, 8.c, 8.d) *(Revised May 2020)*

8.0 Temporary and Permanent Stabilization *(Revised May 2020)*

- 8.1 Permanent Stabilization
- 8.2 Temporary Stabilization
- 8.3 Stabilization During Non-Growing Season
- 8.4 Riparian Buffer Stabilization

9.0 Long Term Operation and Maintenance Schedule (NOI Checklist Item 7.j)

10.0 Recycling and Disposal of Materials (NOI Checklist Item 7.k)

11.0 Thermal Impacts (NOI Checklist Item 7.m)

12.0 Antidegradation Requirements (NOI Checklist Item 7.o, 8.f)

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14.0 Offsite Discharge Analysis *(Added May 2020)*

15.0 Non-Structural and Structural Water Quality BMP Description *(Added May 2020)*

15.0 The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques

Attachments

1 Project Location Maps

2 Soils Map and Report

3 Site Evaluation and Soil Infiltration Test Report *(Added May 2020)*

4 PCSM Plan BMP Design Worksheets and Calculations *(Revised May 2020)*

5 Non-Structural and Structural Water Quality BMPs Map *(Added May 2020)*

6 Offsite Discharge Report *(Added May 2020)*

Drawings (NOI Checklist Item 7.i) *(Revised May 2020)*

1 of 6 Post Construction Stormwater Management Plan Cover

2 of 6 Post Construction Stormwater Management Plan Existing Conditions

3 of 6 Post Construction Stormwater Management Plan Proposed Conditions

4 of 6 Post Construction Stormwater Management Plan Notes

5 - 6 of 6 Post Construction Stormwater Management Plan Details

1.0 Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Leidy South Project – Benton Loop. The Benton Loop will consist of approximately 3.5 miles of 42-inch pipeline co-located with the existing Transco Leidy Lines between approximate MPs 116.95 and 120.44 in Jordan Township, Lycoming County, Pennsylvania. Transco will be installing a Mainline Valve (MLV) near the eastern terminus of the Benton Loop as a means to isolate gas flows along sections of a pipeline.

The Benton Loop is proposed as part of the overall Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

This PCSM Plan has been developed for the eastern terminus Main Line Valve and Access Road site. The PCSM Plan shall be designed and implemented to be consistent with the Post Construction Stormwater Management (PCSM) Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). All work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the Benton Loop Eastern Terminus MLV site will be approximately 4.6 acres. Subject to receipt of permits and authorizations, Transco anticipates construction of the Project would commence in January 2021 to meet a target in-service date of December 1, 2021.

2.0 Topographic Features of the Area (NOI Checklist Item 7.a)

Project Location Map for the eastern terminus MLV site is included in Attachment 1. The map shows the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Elk Grove and Sonestown, Pennsylvania quadrangles.

3.0 Receiving Surface Waters (NOI Checklist Item 7.e)

The following table (Table 1) lists each watershed located in eastern terminus MLV Project area, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCGP-3 permit application.

Table 1 Receiving Waters			
Watershed Name	**Designated Use**	**Existing Use**	**PFBC Classification**
Little Fishing Creek	CWF, MF	EV, MF	Class A Wild Trout
EV: Exceptional Value, MF: Migratory Fishes, CWF: Cold Water Fishes			

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 7.b, 7.l, 8.a, 8.e)

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 2 soil mapping units located within the LOD for eastern terminus MLV site, see Table 2 below:

Table 2 – Soils mapping units within the LOD	
Soil Mapping Unit	**Soil Series**
AbB	Albrights silt loam, 3 to 8 percent slopes
LkC	Leck kill channery silt loam, 8 to 15 percent slopes
LkB	Leck kill channery silt loam, 3 to 8 percent slopes

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the eastern terminus MLV site and resolutions were identified in Section 4.1.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Albrights	AbB	X	C/S	X	X		X	X	X	X	X	X	X				X
Leck Kill	LkC, LkB	X	C						X	X	X	X	X				X

4.1 Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.
3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with all local, state, and federal regulations.
4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.
5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.
6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.
7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.
8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc. to minimize soil erosion.

4.2 Geologic Formations

Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis

completed for the Project revealed that the Benton Loop does not cross any known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Benton Loop lies within a zone of moderate to low landslide incidence and susceptibility.

Due to the moderate to low landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed and is submitted with this application (Attachment B). This report provides information about any potential geological hazards occurring in the vicinity of the Benton Loop Project area. The Geological Hazard Assessment and Mitigation Plan also identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 7.c)

Transco will be installing a Mainline Valve (MLV) near the eastern terminus of the Benton Loop as a means to isolate gas flows. Pig launchers/receivers, valves, communication tower and other ancillary equipment will be located at this MLV facility. All work and disturbed areas are located within Transco property, existing easements, or legally obtained workspace where the past, present, and proposed land use is primarily an existing pipeline ROW. All disturbed areas within the temporary workspaces will be restored to the original contours. Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (https://www.mrlc.gov/viewer/), it appears that a major portion of the eastern terminus site was existing and maintained gas pipeline right-of-way for the past 20 years and will continue to be an existing and maintained gas pipeline right-of-way once the Project is complete. Along the edges of the ROW land use is primarily forested. Based on the surrounding land characteristics, land use prior to ROW construction within the past 50 years would likely have been either forested land or meadow. The proposed construction at the MLV site will consist of a gravel pad and an associated access road. The contractor will construct stormwater BMPs to mitigate the increase in volume and peak rates associated with construction. The proposed BMPs are designed to store the net increase in volume between the pre- and post-development 2-year rain events. Refer to the Stormwater BMP Sizing Calculations in Attachment 4 for additional information.

6.0 Post Construction Stormwater Management Best Management Practices, Installation Sequence and PCSM Critical Stages (NOI Checklist Item 7.f, 7.g)

Increase in stormwater runoff during and after construction shall be controlled by

sequencing the operations and using a selection of Best Management Practices (BMPs). A wet detention pond will be utilized to capture excess runoff generated due to increased impervious area. Sediment basin used temporarily at the site for E&S control will be dewatered and later converted to the wet pond. A diversion channel will convey runoff from disturbed areas to the wet pond. All BMP design calculations and drawings are provided in Attachment 4 and PCSM Plan set.

BMP Installation Sequence (NOI Checklist Item 7.g)

The PCSM BMPs should be installed in a manner designed to:

1. Protect BMP areas associated with infiltration from compaction prior to and during installation.
2. Maintain proper Erosion and Sediment Control Measures during construction.
3. Wet Detention Pond with Forebay
    a. Dewater the sediment basin and flush out the outlet pipe and outlet basin to clean excess accumulated sediment.
    b. Remove any temporary risers from the basin and install permanent risers
    c. Make any necessary repairs to the basin bottom and inside slopes. This includes repairs to the 12” compacted soil subbase and/or 12” topsoil cover.
    d. Remove existing vegetation from the basin bottom. Apply erosion control measures as necessary.
    e. As areas are completed, seed, plant and mulch in accordance with the section below.
    f. Install anti-grazing measures, if necessary
    g. Wet pond bottom shall be revegetated with ERNST seeds ERNMX-128, seasonally flooded wildlife food mix, or approved equal. Where necessary, reseed and mulch interior side slopes with same seed mix utilized for revegetating the sedimentation basin.
4. Select plants that are well adapted to the specific site conditions. Meadow plants must be able to out compete weed species in the first few years as they become established.
5. All temporary E&S BMPs will be removed following site stabilization. Other Erosion

and Sediment Control measures are not to be removed until the site is fully stabilized.

6. All installed BMPs will be monitored until final site stabilization is achieved.
7. Long term operation and maintenance guidelines discussed below shall be followed.

PCSM Critical Stages

Critical points requiring visits by the licensed professional or delegate are as follows:

1. Following final grading of the wet pond, forebay, access road and outlet structures in order to confirm they have been constructed according to the plan details for proper collection, infiltration, and conveyance of runoff. Periodic assessments will need to be made to ensure that accumulated sediment should be cleaned out so the basin maintains necessary design volume.
2. During the layout and excavation of the outlet structures, the professional or delegate will ensure sizing, materials specifications, and construction procedures are followed to enable proper storage and discharge to the pond/basin.
3. For final inspection of BMPs.
4. At the establishment of 70% vegetation covers to allow removal of E&S controls.

7.0 Net Change in Volume and Rate of Runoff (NOI Checklist Item 7.d, 8.b, 8.c, 8.d)

An analysis of pre- and post-development stormwater runoff was performed for the proposed eastern terminus MLV site of Benton Loop. The installation of valve and associated access road will increase the volume of stormwater runoff between the pre and post development 2 year rain event due to the increase in the type and size of the impervious area. The increase in impervious area will increase the pre to post development peak runoff for the 1, 2, 10, 25, 50, and 100-year storm events. Design calculations using HydroCAD software are included in Attachment 4. Refer to the Post-Construction Stormwater Management (PCSM) Plan drawings for additional information.

Pre- and Post-Construction Stormwater Volume for 2-yr Rainfall event

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction after BMPs (cf)	Net (cf)
0	0	0	0

Pre-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year

0.00	0.00	0.02	0.10	0.33	1.14

Post-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.00	0.00	0.04	0.19	0.65	1.92

Post-Construction w/ BMPs Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.00	0.00	0.01	0.06	0.19	0.61

Difference between Pre-Construction and Post-Construction w/ BMPs

	1-year	2-year	10-year	25-year	50-year	100-year
NET Difference	0.00	0.00	-0.01	-0.04	-0.14	-0.53

8.0 Temporary and Permanent Stabilization

Appropriate seed mixtures for temporary and permanent stabilization are outlined on the notes sheet of the plan drawings.

8.1 Permanent Stabilization

Upon final completion of an earth disturbance activity or any stage or phase of an activity, the site shall immediately have topsoil restored, replaced, or amended, seeded, mulched or otherwise permanently stabilized and protected from accelerated erosion and sedimentation. E&S BMPs shall be implemented and maintained until the permanent stabilization is completed. Once permanent stabilization has been established, the temporary E&S BMPs shall be removed. Any areas disturbed in the act of removing temporary E&S BMPs shall be permanently stabilized upon completion of the temporary E&S BMP removal activity. For an earth disturbance activity or any stage or phase of an activity to be considered permanently stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which permanently minimizes accelerated erosion and sedimentation.

- When erosion and sedimentation controls are to be removed in agricultural non-sensitive areas (streams/wetlands), agricultural landowners shall maintain agricultural BMPs per PaDEP regulations.

8.2 Temporary Stabilization

Upon temporary cessation of an earth disturbance activity or any stage or phase of an activity where a cessation of earth disturbance activities will exceed 4 days (including agricultural areas), the site shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage or phase of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which temporarily minimizes accelerated erosion and sedimentation.

8.3 Stabilization During Non-Growing Season

When utility construction must be done and is completed during a non-growing season, interim stabilization BMPs must be implemented and adequately maintained. The application of straw mulch at the rate of 3.0 tons per acre is required. The BMPs should be inspected weekly (unless snow covered) and after each runoff event to identify areas that become bare. All temporary erosion and sediment pollution controls must be maintained.

8.4 Riparian Buffer Stabilization

Temporary Cover for riparian areas to include see from mixture 1 from Table 11.4 (provided in the PCSM Plan set), at the outlined seeding rate. Permanent cover for riparian areas will include 20 lbs/acre of Ernst 178 Riparian buffer mix. Where slopes exceed 10%, seed Mixture 2 from Table 11.4 shall be utilized.

9.0 Long Term Operation and Maintenance Schedule (NOI Checklist Item 7.j)

All BMPs should be properly maintained to ensure their effectiveness. Sheet flow conditions and infiltration must be sustained throughout the life of the BMP. BMPs should be inspected for clogging from sediment of debris, damage by foot or vehicular traffic, and flow channelization. Inspections should be made on a quarterly basis for the first two years following

installation, and then twice per year thereafter. Inspections should also be made after every storm event greater than 1 inch during the establishment period.

Channel linings should be inspected for signs of erosion or dislodging, as applicable. Channels should be inspected for debris, overgrown vegetation, and other blockages. Catch Basins and Inlets should be inspected and cleaned at least two times per year and after runoff events. Vegetation along the surface of the infiltration basin should be maintained in good conditions. Vehicles should not be parked or driven on an infiltration basin and care should be taken to avoid excessive compaction by mowers. Inspect the basin after runoff events and make sure that runoff drains within 72 hours. Wet pond should be inspected at least 4 times per year and after major storms (> 2 inches per 24 hours) or rapid ice breakup. The pond drain should be inspected and tested 4 times per year.

Operation and maintenance guidelines should be provided to all facility owners and tenants. Sediment and debris should be routinely removed upon observation. If erosion is observed, measures should be taken to improve dispersion method to address the source of erosion. Sediment should be removed when the BMP is thoroughly dry. Trash and debris removed from the site should be deposited only at suitable disposal/recycling sites and must comply with applicable local, state, and federal waste regulations. Grass cover should be mowed with low ground pressure equipment as needed to control noxious weeds. Mowing should be done only when the soil is dry in order to prevent tracking damage to vegetation, soil compaction, and flow concentrations. If vegetative cover is not fully established within the designated time, it should be replaced with an alternative species. Unwanted or invasive growth should be removed on an annual basis.

During the first growing season or until established, wet pond vegetation should be inspected every 2 to 3 weeks. Wet ponds should be inspected at least 4 times per year and after major storms (greater than 2 inches in 24 hours) or rapid ice breakup. Inspections should access the vegetation, erosion, flow channelization, bank stability, inlet/outlet conditions, embankment and sediment/debris accumulation. Pond drains should be inspected 4 times per year.

Vegetated areas will be inspected weekly and after runoff events until permanent vegetation is achieved. Once the vegetation is established, inspections of health, diversity, and density should be performed at least twice per year, during both the growing and non-growing season. Vegetative cover should be sustained at 85% and reestablished if damage greater than

50% is observed. Damaged BMPs will be repaired as soon as possible upon discovery. Repairs will be made to restore damaged BMPs to their original design condition.

10.0 Recycling and Disposal of Materials (NOI Checklist Item 7.k)

The restoration of the pipeline right-of-way will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here):

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Material Safety Data Sheets (MSDSs).

11.0 Thermal Impacts (NOI Checklist Item 7.m)

Due to the overall nature of the Project, thermal impacts to surface waters are not anticipated. The primary means to address thermal impacts on this Project is to limit the size and duration of exposed earth. Revegetation procedures and the Sequence of Construction outline disturbed areas being immediately revegetated.

Stormwater runoff associated with the installation of the MLV will be routed through the stormwater BMP's designed to retain the first surge of water from the site. The first surge of water will be the warmest water for the duration of the storm event and will quickly cool as the storm event progresses. The BMPs are designed to capture this warmest surge of stormwater. Based on routing calculations, stormwater is not discharged from the BMPs for the first 12 hours during a 100-year/24-hour storm event. The retention period is longer for less intense storms. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

12.0 Antidegradation Requirements (NOI Checklist Item 7.o, 8.f)

Transco evaluated the feasibility of non-discharge alternatives that would be located outside of exceptional value (EV) or high-quality (HQ) watersheds. Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. The hydraulic model determined the eastern and western terminus of the Benton Loop. In order for the Project to meet the required purpose and need, siting the Benton Loop outside of EV and HQ watersheds, is not feasible.

Therefore, Transco determined that there are no cost-effective and environmental sound viable non-discharge alternatives for the project. Transco has minimized project impacts to EV and HQ watersheds through the use of co-location with existing pipelines and protecting riparian buffers within the project workspace. Earth disturbance will be minimized to the extent practical and will be phased or sequenced to only disturbed portions that are necessary for the specific scope of work. Wherever possible, the LOD was decreased to avoid disturbing additional ground and will be kept to the minimum width and depth necessary to safely complete construction activities

Anti-Degradation Best Available Combination of Technologies (ABACT) standards have been proposed for the eastern terminus MLV site because there are no viable non-discharge alternatives. The Erosion and Sediment Control Plan prepared for the Project outlines a more stringent design and E&S BMPs that meet ABACT standards.

The eastern terminus MLV site will result in increased discharge of stormwater to surface waters which will be mitigated by the implementation of post-construction stormwater management (PCSM) BMP's. Proposed PCSM BMPs are designed with stormwater volume reduction and water quality treatment maximized to the extent practicable within the site constraints to maintain and protect existing water quality and existing and designated uses.

13.0 Riparian Buffers (NOI Checklist Item 7.n)

No existing riparian buffers have been identified within the proposed impervious area associated with the eastern terminus MLV site location; however, a portion of the Project's LOD associated with the installation of the proposed post-construction stormwater management best management practice is located with the non-forested riparian buffer associated with stream S1-T6. However, linear projects such as pipelines qualify for an exemption of the riparian buffer requirement per 25 PA Code §102.14(d)(2)(ii). A riparian buffer waiver has thus been requested along with this ESCGP-3 application (Section 1-7).

14.0 Offsite Discharge Analysis

The stormwater BMP's being constructed at Eastern Terminus Main Line Valve site are in areas that will discharge stormwater to offsite non-surface water. These areas have been analyzed to ensure that these discharges will be non-erosive to adjacent property owners. The analysis has been performed in accordance with PADEP Document 3150-FS-DEP4124, "Off-Site Discharges of Stormwaters to Areas That Are Not Surface Waters". The analysis is presented in Attachment 6- Offsite Discharge Report. Criteria used to determine that offsite erosion at each discharge point will not occur are presented below:

<u>Wet Detention Pond with Forebay</u>

This wet detention pond is in the southeastern part of the Eastern Terminus Main Line Valve site. The outfall discharges to a sediment trap outlet basin at the northeast corner of the wet pond. Calculations provided for the project site runoff show that there is no net increase in rate of runoff during any storm event at the outfall. The area downstream of the outfall is over 90% vegetated. Additionally, the velocity coming out of the outfall protection for the 25-year 24-hour was calculated and found to be 0.88 fps. Since the outlet velocity is below 2.5 fps downstream erosion will be minimal if not negligible.

15.0 Non-Structural and Structural Water Quality BMP Description

Limit of disturbance will be minimized to the maximum extent possible by disturbing only those areas necessary to complete the proposed earthwork and BMP installations.

Sensitive features such as wetlands will be protected to the maximum extent possible. These areas will be clearly delineated in the field and protected prior to any construction activities taking place. Existing vegetation is not to be removed from the protected area and the areas shall not be subject to grading or movement of existing soils. Any protected areas that have been disturbed/compacted during construction will be restored using soil amendment and restoration.

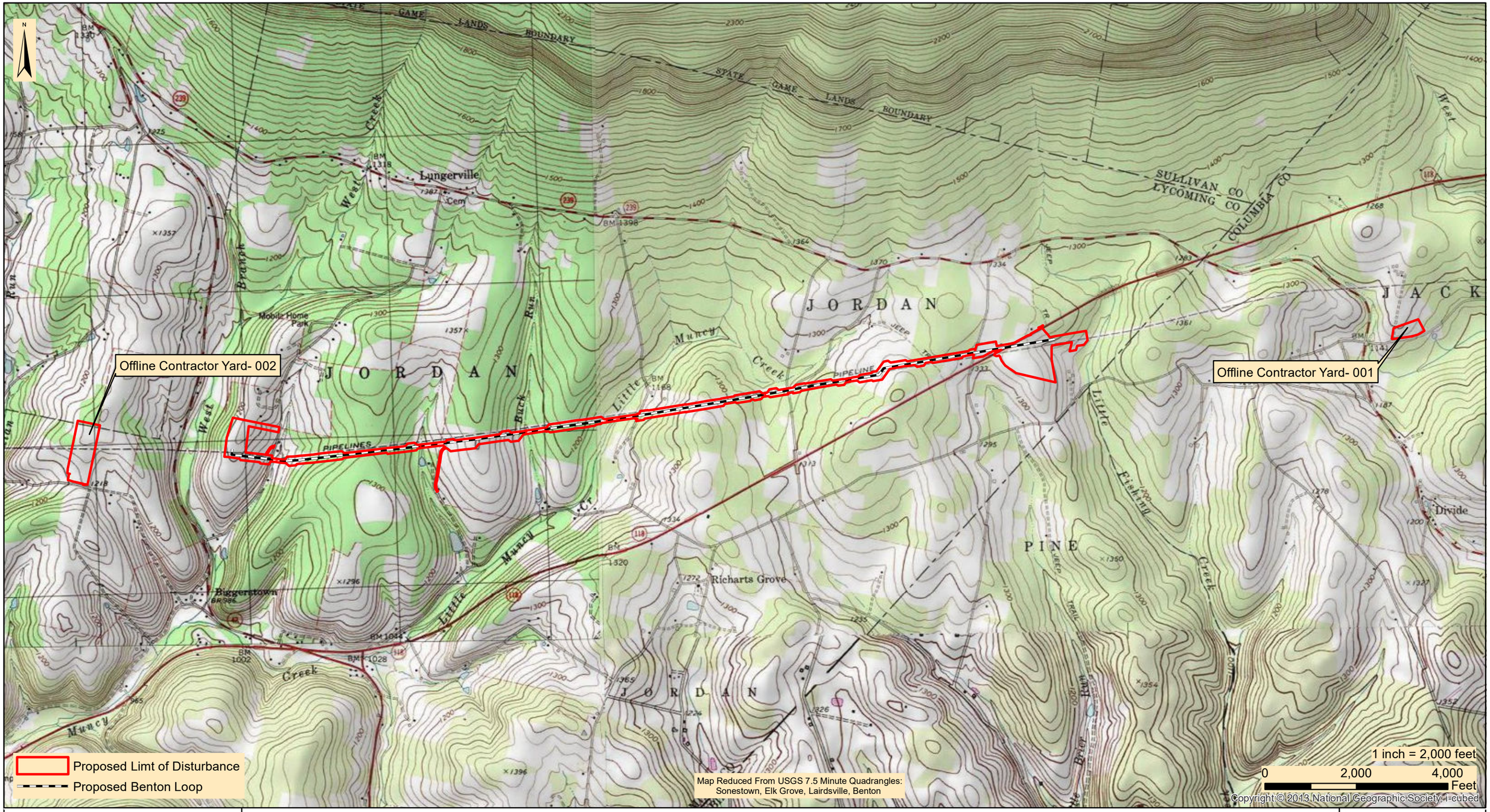
Disturbed areas that are not proposed to be impervious will be revegetated as per the seeding and mulching notes provided in PCSM plan notes.

At the Eastern Terminus Valve Yard site, wet detention pond will act as a water quality BMP. Wherever possible, existing natural drainage patterns will be utilized to divert flow to the proposed wet pond. Relatively steeper slopes are utilized for the wet pond embankments to minimize disturbance to existing streams and wetlands.

16.0 The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques

These plans and narrative were prepared by Kevin Clark, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Stormwater BMP Manual, December 2006. Plan preparer's resume is provided in Attachment C of the ESCGP-3 permit package).

ATTACHMENT 1
PROJECT LOCATION MAP



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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 42" BENTON LOOP
PROJECT LOCATION MAP

LYCOMING & COLUMBIA COUNTIES PENNSYLVANIA

Date:	4/28/2020
WHM DRAWING NUMBER:	WILLIAMS202B003
Drawn By:	FTN
Figure Number:	1

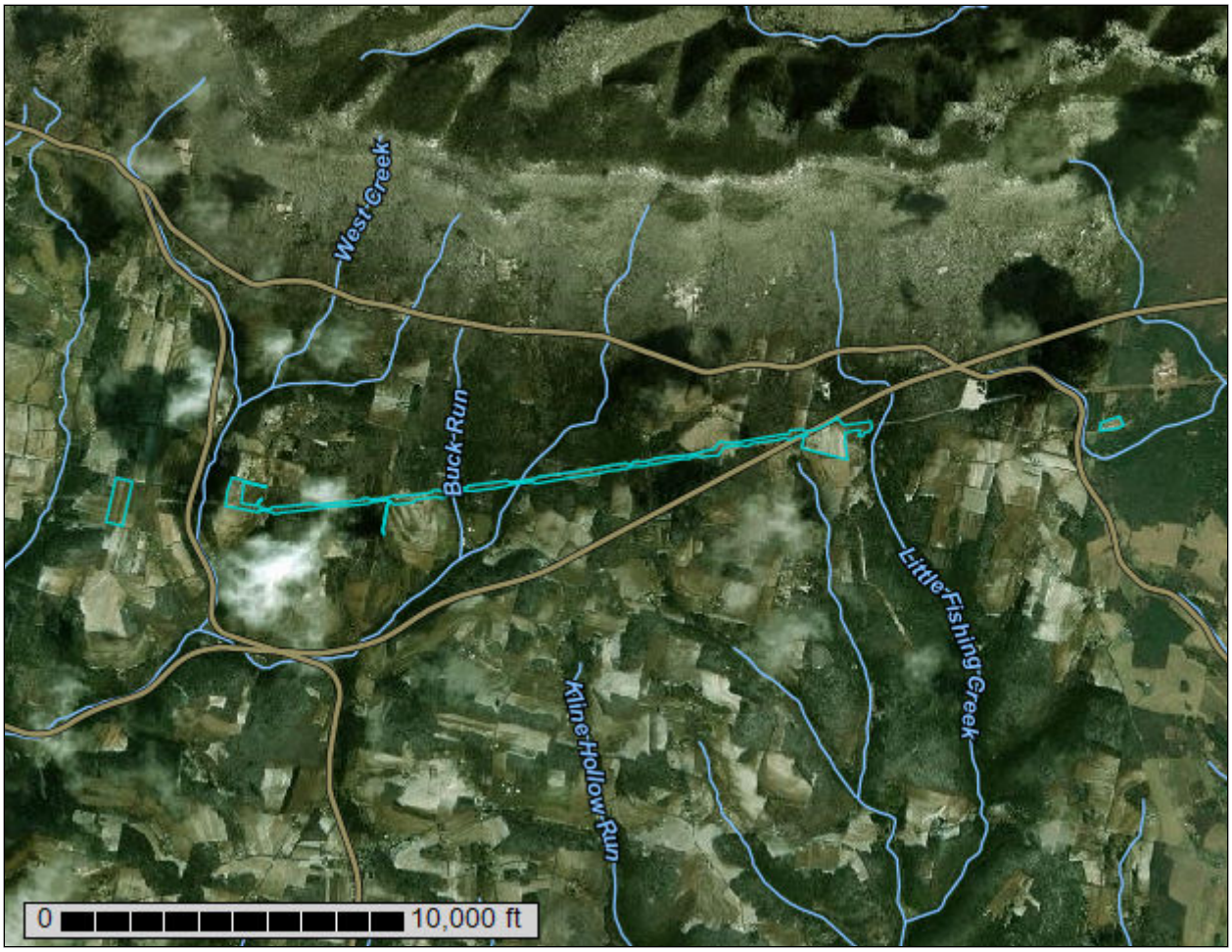
ATTACHMENT 2
SOILS MAP AND REPORT

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Columbia County, Pennsylvania, and Lycoming County, Pennsylvania



May 29, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

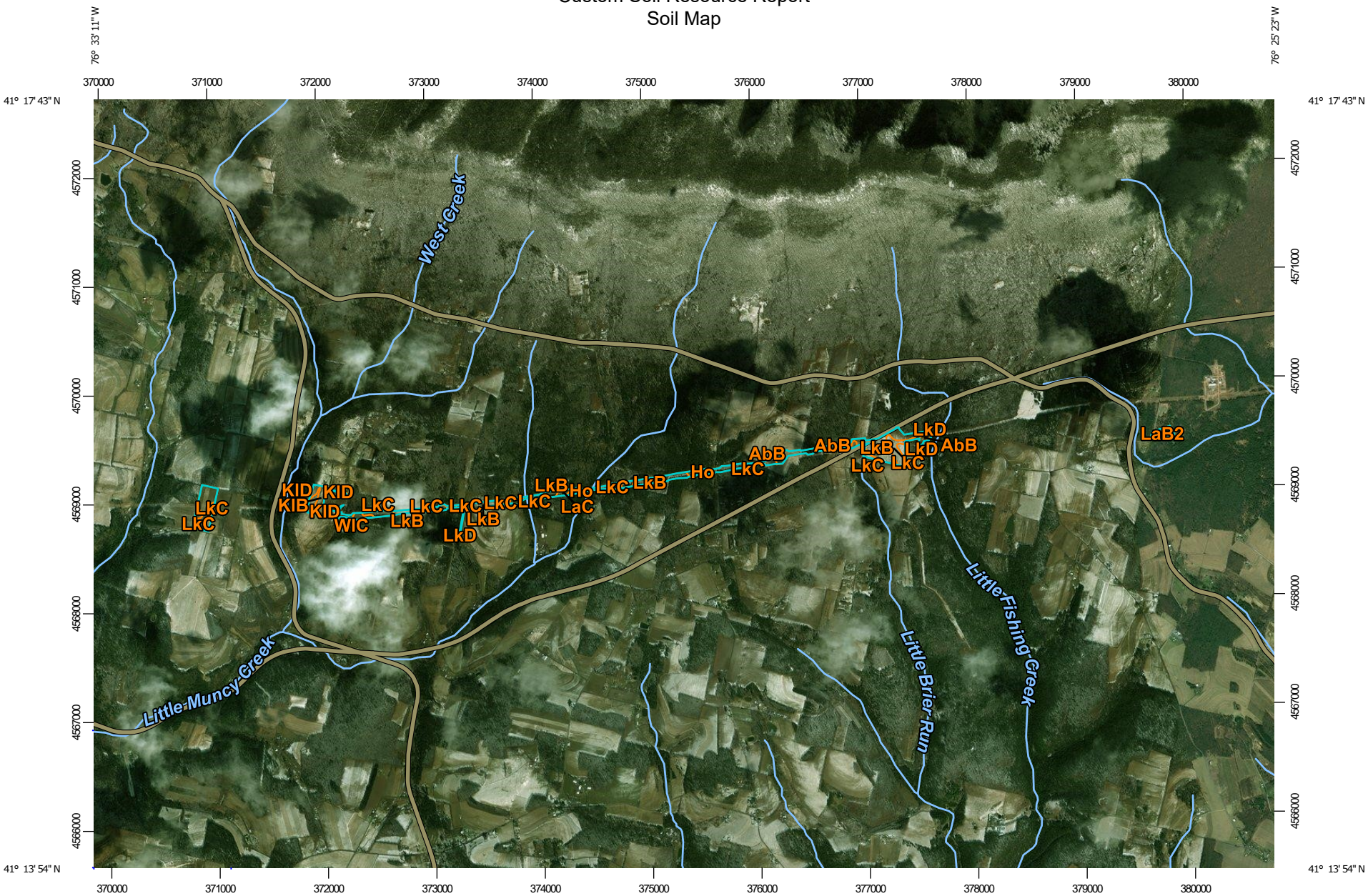
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:49,800 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 500 1000 2000 3000

Feet: 0 2000 4000 8000 12000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Columbia County, Pennsylvania
Survey Area Data: Version 13, Sep 18, 2018

Soil Survey Area: Lycoming County, Pennsylvania
Survey Area Data: Version 13, Sep 18, 2018

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 29, 2010—Nov 22, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
LaB2	Lackawanna channery loam, 3 to 12 percent slopes, eroded	4.2	3.8%
Subtotals for Soil Survey Area		**4.2**	**3.8%**
Totals for Area of Interest		**112.2**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AbB	Albrights silt loam, 3 to 8 percent slopes	4.2	3.8%
AbC	Albrights silt loam, 8 to 15 percent slopes	0.9	0.8%
Ho	Holly silt loam	3.0	2.7%
KlB	Klinesville shaly silt loam, 3 to 8 percent slopes	3.2	2.8%
KlC	Klinesville shaly silt loam, 8 to 15 percent slopes	5.3	4.7%
KlD	Klinesville shaly silt loam, 15 to 25 percent slopes	5.3	4.8%
LaC	Lackawanna channery silt loam, 8 to 15 percent slopes	1.5	1.3%
LkB	Leck kill channery silt loam, 3 to 8 percent slopes	45.3	40.3%
LkC	Leck kill channery silt loam, 8 to 15 percent slopes	30.2	26.9%
LkD	Leck kill channery silt loam, 15 to 25 percent slopes	6.4	5.7%
WkE	Weikert and Klinesville shaly silt loams, 25 to 80 percent slopes	1.4	1.3%
WlC	Wellsboro channery silt loam, 8 to 15 percent slopes	1.3	1.2%
Subtotals for Soil Survey Area		**108.0**	**96.2%**
Totals for Area of Interest		**112.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named

according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Columbia County, Pennsylvania

LaB2—Lackawanna channery loam, 3 to 12 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2w0bc
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lackawanna, eroded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna, Eroded

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 7 inches: channery loam
Bw1 - 7 to 17 inches: channery loam
Bw2 - 17 to 26 inches: channery loam
Bx - 26 to 60 inches: channery loam
C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 3 to 12 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 17 to 36 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 16 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 10 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Oquaga

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Mountainflank, nose slope, crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

Lycoming County, Pennsylvania

AbB—Albrights silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2stxm
Elevation: 550 to 2,910 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Albrights and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Albrights

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Acid fine-loamy colluvium derived from sandstone and shale

Typical profile

Ap - 0 to 7 inches: silt loam
BA - 7 to 11 inches: channery silt loam
Bt - 11 to 18 inches: clay loam
Btx - 18 to 54 inches: channery silty clay loam
C - 54 to 65 inches: channery silty clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 16 to 32 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 10 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Leck kill

Percent of map unit: 5 percent

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Convex
Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Calvin

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

AbC—Albrights silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2sgr2
Elevation: 550 to 2,910 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Albrights and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Albrights

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Acid fine-loamy colluvium derived from sandstone and shale

Typical profile

A - 0 to 2 inches: silt loam
E - 2 to 6 inches: silt loam
Bt - 6 to 28 inches: silty clay loam
Btx - 28 to 65 inches: very channery silty clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 18 to 32 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 10 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Leck kill

Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Concave
Across-slope shape: Convex
Hydric soil rating: No

Calvin

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Ho—Holly silt loam

Map Unit Setting

National map unit symbol: l2yr
Elevation: 1,000 to 1,170 feet
Mean annual precipitation: 38 to 46 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 101 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Holly and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Holly

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 23 inches: silt loam
H3 - 23 to 43 inches: sandy loam
H4 - 43 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Very poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Occasional
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

KlB—Klinesville shaly silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l2ys
Elevation: 300 to 1,300 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Klinesville and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Klinesville

Setting

Landform: Low hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Shale and siltstone residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 4 inches: channery silt loam
H2 - 4 to 12 inches: very channery silt loam
H3 - 12 to 19 inches: very channery silt loam
H4 - 19 to 23 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 4.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Brinkerton

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

KlC—Klinesville shaly silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l2yt
Elevation: 300 to 1,300 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

Klinesville and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Klinesville

Setting

Landform: Low hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Shale and siltstone residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 4 inches: channery silt loam
H2 - 4 to 12 inches: very channery silt loam
H3 - 12 to 19 inches: very channery silt loam
H4 - 19 to 23 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 4.00 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Brinkerton
Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

KID—Klinesville shaly silt loam, 15 to 25 percent slopes

Map Unit Setting
National map unit symbol: l2yv
Elevation: 300 to 1,300 feet
Mean annual precipitation: 38 to 46 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Klinesville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Klinesville

Setting
Landform: Low hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Shale and siltstone residuum weathered from shale and siltstone

Typical profile
H1 - 0 to 4 inches: channery silt loam
H2 - 4 to 12 inches: very channery silt loam
H3 - 12 to 19 inches: very channery silt loam
H4 - 19 to 23 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 4.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Hydric soil rating: No

LaC—Lackawanna channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w095
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lackawanna and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 7 inches: channery silt loam
Bw1 - 7 to 17 inches: channery silt loam
Bw2 - 17 to 26 inches: channery loam
Bx - 26 to 60 inches: channery loam
C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 17 to 36 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 16 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 10 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Oquaga

Percent of map unit: 3 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Upper third of mountainflank, crest, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Morris

Percent of map unit: 2 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

LkB—Leck kill channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l2z5
Elevation: 300 to 2,800 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 130 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Leck kill and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Leck Kill

Setting

Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Reddish residuum derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: channery silt loam
H2 - 10 to 43 inches: channery silt loam
H3 - 43 to 58 inches: very channery silt loam
R - 58 to 62 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 80 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Klinesville

Percent of map unit: 5 percent
Hydric soil rating: No

LkC—Leck kill channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l2z6
Elevation: 500 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 130 to 190 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Leck kill and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Leck Kill

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Reddish residuum derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: channery silt loam
H2 - 10 to 43 inches: channery silt loam
H3 - 43 to 58 inches: very channery silt loam
R - 58 to 62 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 40 to 80 inches to lithic bedrock
Natural drainage class: Well drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

LkD—Leck kill channery silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: l2z7
Elevation: 300 to 2,800 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Leck kill and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Leck Kill

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 10 inches: channery silt loam
H2 - 10 to 43 inches: channery silt loam
H3 - 43 to 58 inches: very channery silt loam
R - 58 to 62 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 40 to 80 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Calvin

Percent of map unit: 10 percent
Hydric soil rating: No

Klinesville

Percent of map unit: 5 percent
Hydric soil rating: No

Meckesville

Percent of map unit: 5 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

WkE—Weikert and Klinesville shaly silt loams, 25 to 80 percent slopes

Map Unit Setting

National map unit symbol: l30k
Elevation: 300 to 1,600 feet
Mean annual precipitation: 38 to 46 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Weikert and similar soils: 55 percent
Klinesville and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weikert

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 6 inches: channery silt loam
H2 - 6 to 20 inches: very channery silt loam
H3 - 20 to 24 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 80 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 4.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Klinesville

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

Typical profile

H1 - 0 to 4 inches: channery silt loam
H2 - 4 to 12 inches: very channery silt loam
H3 - 12 to 19 inches: very channery silt loam
H4 - 19 to 23 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 80 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 4.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

WIC—Wellsboro channery silt loam, 8 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2vck6
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Wellsboro and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wellsboro

Setting
Landform: Hills, mountains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile
Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 22 inches: channery silt loam
Bx - 22 to 55 inches: channery loam
C - 55 to 72 inches: very channery loam

Properties and qualities
Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 14 to 30 inches to fragipan
Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Lackawanna

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Morris

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

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ATTACHMENT 3
SITE EVALUATION AND SOIL INFILTRATION TEST REPORT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC.
BENTON LOOP ACCESS ROAD & VALVE YARD PROJECT

SITE EVALUATION AND SOIL INFILTRATION REPORT

1.0 Site Soils

Based upon mapping provided by the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS) Web Soil Survey[1], the project area is underlain by the following soil series: Albrights silt loam, 3 to 8 percent slopes (AbB).

Albrights silt loam, 3 to 8 percent slopes (AbB) soils consist of gently sloping, deep, moderately well drained soils, found on mountain slopes. The parent material is Acid fine-loamy colluvium derived from sandstone and shale. Bedrock is typically found at more than 60 inches below surface, and, potentially, a fragipan can be found at a depth between 16 to 32 inches. The available water capacity of this AbB soils is very low. Permeability is moderately slow. Runoff is very high.

The soil infiltration testing described in this section focused on AbB soils. These soils are anticipated as being the primary soils in the area of the potential infiltration basin.

2.0 Field Investigation and Testing Methodology

BAI completed a total of two test pits and two double-ring infiltrometer tests; locations were selected to be representative of the main soil series in the area of the proposed infiltration basin. Figure 1 presents field-located stations of test pits and corresponding double-ring infiltrometer tests.

Two soil test pits (TP-1 and TP-2) were dug by hang on June 4, 2019 to depths of approximately 24 inches to evaluate infiltration rates within soils in the study area. Two double-ring infiltrometer (DRI) tests were conducted on June 4, 2019 within each of the test pits completed by BAI. The double-ring infiltration tests consisted of an 11-inch diameter outer ring (OR) and a 4-inch diameter inner ring (IR) set 4-5 inches deep into the bottom of each test pit (approximately 28 inches below grade) to determine infiltration rates of shallow soils at various locations across the site. DRI testing was initiated by completing a one-hour pre-soak, which involved adding six (6) inches of head to both the OR and IR. By noting the drop in head in each infiltrometer at 30 minute increments during the pre-soak, BAI determined that 30-minute testing interval for TP-1 and 10-minute testing intervals for TP-2, would be used for DRI testing as per the Pennsylvania stormwater Best Management Practices Manual (Document ID 363-0300-002) Appendix C.

Following the pre-soak, test pits TP-1 and TP-2 were refilled to a six (6) inch head level in both the IR and OR. Drop in head was measured from a fixed reference point in the IR every 30 minutes for TP-1 and 10 minutes TP-2. The IR and OR were refilled following each reading. Results for DRI tests are discussed in Section 3.0.

Two soil borings, BH 1 and BH 2, were completed in May 7, 2020 to characterize soils and identify limiting zones. The two soil borings were made using hollow stem augurs and split spoons until refusal was encountered. The locations of the bore holes are seen in Figure 1 and results are discussed in Section 3.0.

[1] http://websoilsurvey.nrcs.usda.gov/app/

3.0 Findings and Conclusions

Water was noted in the BH 2 boring at a depth of 10 feet below grade surface. Limiting zones were not identified in the BH 1 boring.

The following tables summarize the DRI readings for each test pit and the limiting zones identified in each bore hole.

		Infiltration Testing Results								
Hole	Reading Interval	Reading 1 (in.)	Reading 2 (in.)	Reading 3 (in.)	Reading 4 (in.)	Reading 5 (in.)	Reading 6 (in.)	Reading 7 (in.)	Reading 8 (in.)	Infiltration Rate (in./hr)
TP1	30 min	0.06	0.06	0.06	0.12					0.16
TP2	10 min	0.75	0.50	0.80	0.63	1.00	1.00	0.92	1.00	5.88

TP-1

The infiltration rate within TP-1 was 0.16 inches per hour (iph) based upon an average rate of drop of 0.08 inches over the last four 30-minute infiltration readings.

TP-2

The infiltration rate within TP-2 was 0.41 inches per hour (iph) based upon an average rate of drop of 0.98 inches over the last four 10-minute infiltration readings.

Limiting Zone investigation Results					
Soil Boring	Ground Surface Elevation (ft AMSL)	Seasonal High Water Table (ft)	Bedrock (ft)	Water Table (ft)	Total Depth (ft)
BH1	1248.1	Not Encountered	Not encountered	Not Encountered	12
BH2	1248.4	Not Encountered	Not encountered	10	12

Average Site Infiltration Rate and Discussion

Based upon the results of double-ring infiltration testing completed by BAI, the overall average infiltration rate within the proposed infiltration basin area could not be determined to the highly variable rates between the two testing areas. It is recommended that additional testing is conducted at the site.

References

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH - BENTON LOOP

SOIL TEST PIT LOCATIONS

LYCOMING COUNTY PENNSYLVANIA

Date:	05/22/20
WHM DRAWING NUMBER:	WILLIAMS202B001_IT
Drawn By:	BWH
Figure Number:	1

ATTACHMENT 4

PCSM PLAN BMP DESIGN WORKSHEETS AND CALCULATIONS

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Attachment *(Revised May 2020)*

4.1 Stormwater BMP Manual Appendix D Worksheets- Eastern Terminus MLV

4.2 Channel Design Worksheets (Standard E&S Worksheet #11) - Eastern Terminus MLV

4.3 Outlet Basin Design Worksheet- Eastern Terminus MLV

4.4 HydroCAD Report- Eastern Terminus MLV

ATTACHMENT 4.1

STORMWATER BMP MANUAL APPENDIX D WORKSHEETS- EASTERN TERMINUS MLV

Stormwater BMP Manual Appendix D. Worksheets
Benton Loop Eastern Terminus Main Line Valve and Access Road

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 8/9/2019

Project Name: Leidy South – Benton Loop Easterrn Terminus Main Line Valve and Access Road

Municipality: Township of Jordan

County: Lycoming

Total Area (acres): 4.58

Major River Basin: Susquehanna River

Watershed: Little Fishing Creek

Sub-Basin: Lower West Branch Susquehanna River

Nearest Surface Water(s) to Receive Runoff: Little Fishing Creek

Chapter 93 – Designated Water Use/Existing Water Use: CWF, MF / EV, MF

Impaired according to Category 4 or 5 of the Integrated Water Quality Monitoring and Assessment Report? Yes ☒ No ☐

List Causes of Impairment: Unknown-pathogens; Agriculture-siltation; Road Runoff-siltation; Grazing Related Agric-siltation;

Is there an established TMDL that applies: Yes ☐ No ☒

Total Maximum Daily Loads (TMDLS)

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☒

Existing or planned drinking water supply? Yes ☐ No ☒

If yes, distance from proposed discharge (miles):

Approved Act 167 Plan? Yes ☒ No ☐

Existing River Conservation Plan? Yes ☐ No ☒

Worksheet 2. Sensitive Natural Resources from PA Stormwater Best Management Practices Chapter 5

INSTRUCTIONS

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	yes	0	0
Floodplains	yes	0	0
Riparian Areas	yes	0.69	0
Wetlands	yes	0	0
Woodlands	yes	1.26	0
Natural Drainage Ways	n/a		
Steep Slopes, 15% - 25%	n/a		
Steep Slopes, over 25%	n/a		
Other:			
Other:			
TOTAL EXISTING:		**1.95**	0

Worksheet 3. Nonstructural BMP Credits from PA Stormwater Best Management Practices Manual (SW BMP Manual)

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) 0 **Ac.**

1.2 Area of Riparian Forest Buffer Protection (see WS 2) _____ **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading (See Chapter 8, page 21 – SW BMP Manual) _____ **Ac**

TOTAL 0 **Ac**

Site Area	Minus	Protected Area	=	Stormwater Management Area
4.58	-	0	=	4.58

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction (See Chapter 8, page 22 – SW BMP Manual)

Lawn _____ ft^2 x 1/4" x 1/12 = _____ ft^3

_____

Meadow _____ ft^2 x 1/3" x 1/12 = _____ ft^3

3.3 Protect Existing Trees (See Chapter 8, page 23 – SW BMP Manual)

For Trees within 100 feet of impervious area:

Tree Canopy _____ ft^2 x 1/2" x 1/12 = _____ ft^3

_____ _____

5.1 Disconnect Roof Leaders to Vegetated Areas (See Chapter 8 page 25 – SW BMP Manual)

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Roof Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

5.2 Disconnect Non-Roof impervious to Vegetated Areas (See Chapter 8, page 26 – SW BMP Manual)

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Impervious Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

TOTAL NON-STRUCTURAL VOLUME CREDIT* 0 _____ ft

**For use on Worksheet 5*

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Leidy South – Benton Loop Eastern Terminus Main Line Valve and Access Road

Drainage Area: 10.32 acres

2-Year Rainfall: 3.03 in

Total Site Area: 4.58 acres

Protected Site Area: 0 acres

Managed Area: 4.58 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woodland	LkB/A	53,811	1.24	36	17.78	3.56	0.02	72
Meadow	LkB/A	143,838	3.30	30	23.33	4.67	0.12	1,480
Impervious	LkB/A	1957	0.04	89	1.24	0.25	1.93	314
TOTAL:		199,906	4.58				2.07	1,866

Developed Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woodland	LkB/A	46,115	1.06	36	17.78	3.56	0.02	62
Meadow	LkB/A	137,992	3.17	30	23.33	4.67	0.12	1,419
Impervious	LkB/A	15,569	0.36	89	1.24	0.25	1.93	2,500
TOTAL:		199,606	4.58				2.07	3,981

2-Year Volume Increase (ft3): 2,115

2-Year Volume Increase = Developed Conditions Runoff Volume – Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 5. Structural BMP Volume Credits

PROJECT: Leidy South – Benton Loop Eastern Terminus Main Line Valve and Access Road
SUB-BASIN: Little Fishing Creek

Required Control Volume (ft^3) – *from Worksheet 4*: 2,115

Non-structural Volume Credit (ft^3) – *from Worksheet 3*: - 0
(maximum is 25% of required volume)

Structural Volume Reqmt (ft^3) 2,115

(Required Control Volume minus Non-structural Credit)

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 6		Area (ft^2)	Volume Reduction Permanently Removed (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin	2,200	13,351
6.7.1	Riparian Buffer/Riparian Forest Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): 13,351
Structural Volume Requirement (ft^3): 2,115
DIFFERENCE 11,236

Stormwater BMP Manual Appendix D. Worksheets
Benton Loop Eastern Terminus Main Line Valve and Access Road

Worksheet 10 – Water Quality Compliance for Nitrate		
Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the equivalent) "provided across the site" is taken to mean the specifications for that BMP set forward in Sections 5 and 6 are satisfied. Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 5 & 6		
	Yes	**No**
Primary BMPs for Nitrate:	☐	☐
NS BMP 5.4.2 – Protect/Conserve/Enhance Riparian Buffers	☐	☐
NS BMP 5.5.4 – Cluster Uses at Each Site	☐	☐
NS BMP 5.6.1 – Minimize Total Disturbed Area	☒	☐
NS BMP 5.6.3 – Re-Vegetate/Re-Forest Disturbed Areas (Native Species)	☒	☐
NS BMP 5.9.1 – Street Sweeping/Vacuuming	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
	☐	☐
Secondary BMPs for Nitrate:	☐	☐
NS BMP 5.4.1 – Protect Sensitive/Special Value Features	☐	☐
NS BMP 5.4.3 – Protect/Utilize Natural Drainage Features	☒	☐
NS BMP 5.6.2 – Minimize Soil Compaction	☐	☐
Structural BMP 6.4.5 – Rain Garden/Bioretention	☐	☐
Structural BMP 6.4.8 – Vegetated Swale	☐	☐
Structural BMP 6.4.9 – Vegetated Filter Strip	☐	☐
Structural BMP 6.6.1 – Constructed Wetland	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
Structural BMP 6.7.3 – Soil Amendment/Restoration	☐	☐

ATTACHMENT 4.2

CHANNEL DESIGN WORKSHEETS-
EASTERN TERMINUS MLV

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South-Benton Loop Eastern Terminus Main Line Valve Prepared by: FJ, 8/2019
LOCATION: Lycoming County, PA Checked by: KCC, 8/2019

CHANNEL OR CHANNEL SECTION		DC-BL-4
TEMPORARY OR PERMANENT?	(T OR P)	P
DESIGN STORM	(2, 5, OR 10 YR)	10 yr
ACRES	(AC)	4.033
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	5.28
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	6.9
PROTECTIVE LINING[2]		R-3 Riprap
n (MANNING'S COEFFICIENT)[2]		0.0446
V_a (ALLOWABLE VELOCITY)	(FPS)	6.5
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.8
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.95
CHANNEL BOTTOM WIDTH	(FT)	3
CHANNEL SIDE SLOPES	(H:V)	2
D (TOTAL DEPTH)	(FT)	1.00
CHANNEL TOP WIDTH @ D	(FT)	7.0
d (CALCULATED FLOW DEPTH)	(FT)	0.46
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.84
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	6.52
d_{50} STONE SIZE	(IN)	0.25
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.803
R (HYDRAULIC RADIUS)		0.357
S (BED SLOPE)[3]	(FT/FT)	0.052
S_c (CRITICAL SLOPE)	(FT/FT)	0.043
$.7S_c$	(FT/FT)	0.030
$1.3S_c$	(FT/FT)	0.055
STABLE FLOW?	(Y/N)	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.1
FREEBOARD BASED ON STABLE FLOW	(FT)	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

* Due to PADEP Stormwater BMP design requirements for vegetated swales, the bottom width:flow depth ratio is above 12:1 max for each scenario for the 10-yr storm event.

HYDROCAD CHANNEL PEAK FLOW CALCULATIONS

Summary for Subcatchment BL4: BL-4

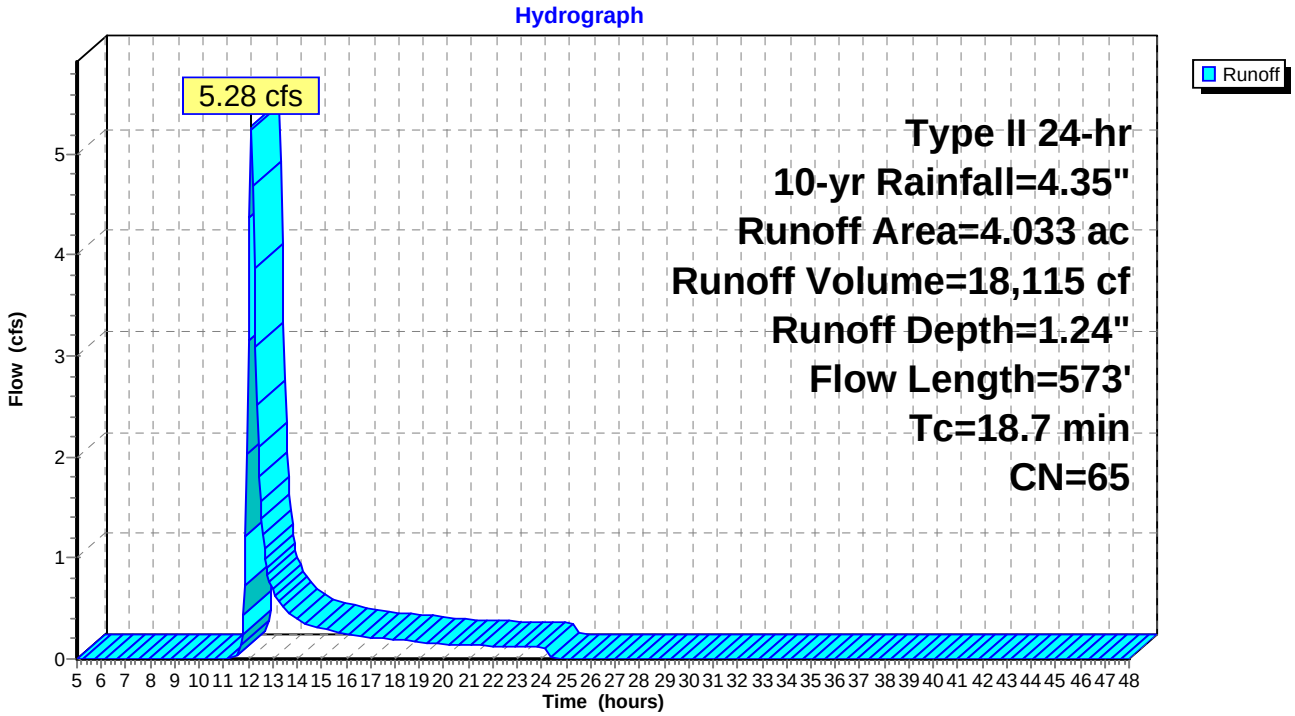
Runoff = 5.28 cfs @ 12.13 hrs, Volume= 18,115 cf, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.35"

Area (ac)	CN	Description
2.750	60	Woods, Fair, HSG B
0.563	58	Meadow, non-grazed, HSG B
0.720	89	Gravel roads, HSG C
4.033	65	Weighted Average
4.033		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.03"
3.5	274	0.0690	1.31		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	118	0.0760	5.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	81	0.1220	2.44		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.7	573	Total			

Subcatchment BL4: BL-4



ATTACHMENT 4.3

OUTLET BASIN DESIGN WORKSHEET-
EASTERN TERMINUS MLV

LEIDY SOUTH PROJECT

BENTON LOOP ACCESS ROAD AND VALVE YARD

OUTLET BASIN DESIGN FOR SED BASIN/WET POND OUTLET

PIPE DIAMETER, D (IN)	FLOW, Q (CFS)	OUTLET BASIN WIDTH, W (FT)	OUTLET BASIN LENGTH, L (FT)	OUTLET BASIN DEPTH (FT)	RIPRAP ROCK SIZE	ROCK THICKNESS (IN)	VELOCITY CHECK (FPS)
15	0	3.75	7.50	1.00	R-3	9	0.00

Weir Flow Equation Used for finding head above crest:

Q=C*L*H^1.5

where Q= flow (cfs)

C= weir coefficient (3.0)

L= Crest Length (ft)

H= Head above crest (ft)

Velocity over weir, v (in fps) = sqrt (2gH), where g= 32.17 fps

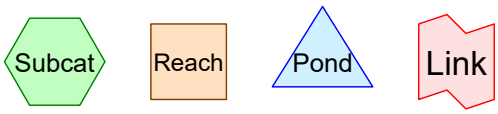
From E&S Manual,

Outlet Basin Length = 6x pipe Diameter

Desirable velocity for downslope grass cover = 2.5 fps

ATTACHMENT 4.4

HYDROCAD REPORT-
EASTERN TERMINUS MLV



Routing Diagram for Benton Valve Yard_new_FPV_post
Prepared by Microsoft, Printed 9/17/2019
HydroCAD® 10.00-20 s/n 09710 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
19,483	89	Gravel (1P, 5S)
370,708	30	Meadow, non-grazed, HSG A (1P, 5S)
509,741	36	Woods, Fair, HSG A (1P, 5S)
899,932	**35**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
880,449	HSG A	1P, 5S
0	HSG B	
0	HSG C	
0	HSG D	
19,483	Other	1P, 5S
899,932		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatc Number
0	0	0	0	19,483	19,483	Gravel	
370,708	0	0	0	0	370,708	Meadow, non-grazed	
509,741	0	0	0	0	509,741	Woods, Fair	
880,449	**0**	**0**	**0**	**19,483**	**899,932**	**TOTAL AREA**	

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=35.8 min CN=34 Runoff=0.00 cfs 0 cf

Subcatchment 5S: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=35.8 min CN=36 Runoff=0.00 cfs 0 cf

Reach 5R: Pre Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach 6R: Post Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 899,932 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"
100.00% Pervious = 899,932 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1P:

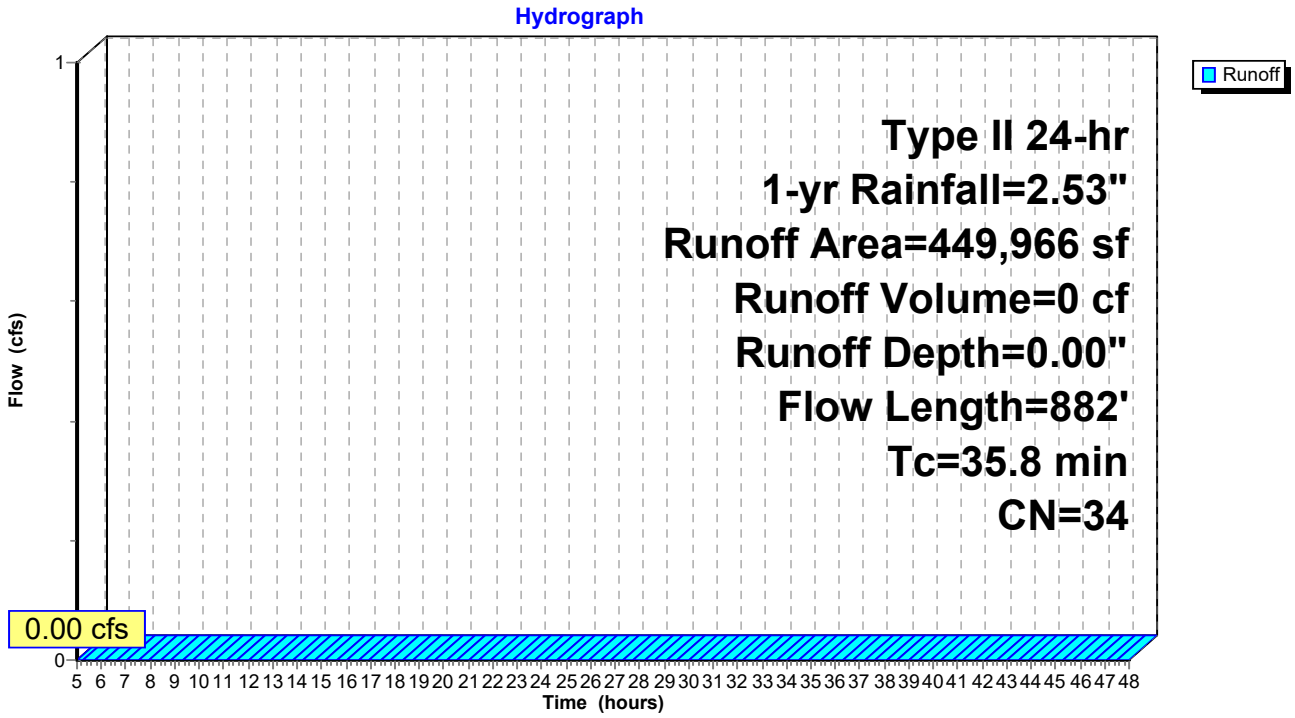
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.53"

	Area (sf)	CN	Description
	258,380	36	Woods, Fair, HSG A
	189,629	30	Meadow, non-grazed, HSG A
*	1,957	89	Gravel
	449,966	34	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 1P:



Hydrograph for Subcatchment 1P:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.16	**0.00**	**0.00**	31.00	2.53	0.00	0.00
5.50	0.18	0.00	0.00	31.50	2.53	0.00	0.00
6.00	0.20	0.00	0.00	32.00	2.53	0.00	0.00
6.50	0.23	0.00	0.00	32.50	2.53	0.00	0.00
7.00	0.25	0.00	0.00	33.00	2.53	0.00	0.00
7.50	0.28	0.00	0.00	33.50	2.53	0.00	0.00
8.00	0.30	0.00	0.00	34.00	2.53	0.00	0.00
8.50	0.33	0.00	0.00	34.50	2.53	0.00	0.00
9.00	0.37	0.00	0.00	35.00	2.53	0.00	0.00
9.50	0.41	0.00	0.00	35.50	2.53	0.00	0.00
10.00	0.46	0.00	0.00	36.00	2.53	0.00	0.00
10.50	0.52	0.00	0.00	36.50	2.53	0.00	0.00
11.00	0.59	0.00	0.00	37.00	2.53	0.00	0.00
11.50	0.72	0.00	0.00	37.50	2.53	0.00	0.00
12.00	1.68	0.00	0.00	38.00	2.53	0.00	0.00
12.50	1.86	0.00	0.00	38.50	2.53	0.00	0.00
13.00	1.95	0.00	0.00	39.00	2.53	0.00	0.00
13.50	2.02	0.00	0.00	39.50	2.53	0.00	0.00
14.00	2.07	0.00	0.00	40.00	2.53	0.00	0.00
14.50	2.12	0.00	0.00	40.50	2.53	0.00	0.00
15.00	2.16	0.00	0.00	41.00	2.53	0.00	0.00
15.50	2.20	0.00	0.00	41.50	2.53	0.00	0.00
16.00	2.23	0.00	0.00	42.00	2.53	0.00	0.00
16.50	2.25	0.00	0.00	42.50	2.53	0.00	0.00
17.00	2.28	0.00	0.00	43.00	2.53	0.00	0.00
17.50	2.31	0.00	0.00	43.50	2.53	0.00	0.00
18.00	2.33	0.00	0.00	44.00	2.53	0.00	0.00
18.50	2.35	0.00	0.00	44.50	2.53	0.00	0.00
19.00	2.37	0.00	0.00	45.00	2.53	0.00	0.00
19.50	2.39	0.00	0.00	45.50	2.53	0.00	0.00
20.00	2.41	0.00	0.00	46.00	2.53	0.00	0.00
20.50	2.42	0.00	0.00	46.50	2.53	0.00	0.00
21.00	2.44	0.00	0.00	47.00	2.53	0.00	0.00
21.50	2.46	0.00	0.00	47.50	2.53	0.00	0.00
22.00	2.47	0.00	0.00	48.00	2.53	0.00	0.00
22.50	2.49	0.00	0.00				
23.00	2.50	0.00	0.00				
23.50	2.52	0.00	0.00				
24.00	**2.53**	0.00	0.00				
24.50	2.53	0.00	0.00				
25.00	2.53	0.00	0.00				
25.50	2.53	0.00	0.00				
26.00	2.53	0.00	0.00				
26.50	2.53	0.00	0.00				
27.00	2.53	0.00	0.00				
27.50	2.53	0.00	0.00				
28.00	2.53	0.00	0.00				
28.50	2.53	0.00	0.00				
29.00	2.53	0.00	0.00				
29.50	2.53	0.00	0.00				
30.00	2.53	0.00	0.00				
30.50	2.53	0.00	0.00				

Summary for Subcatchment 5S:

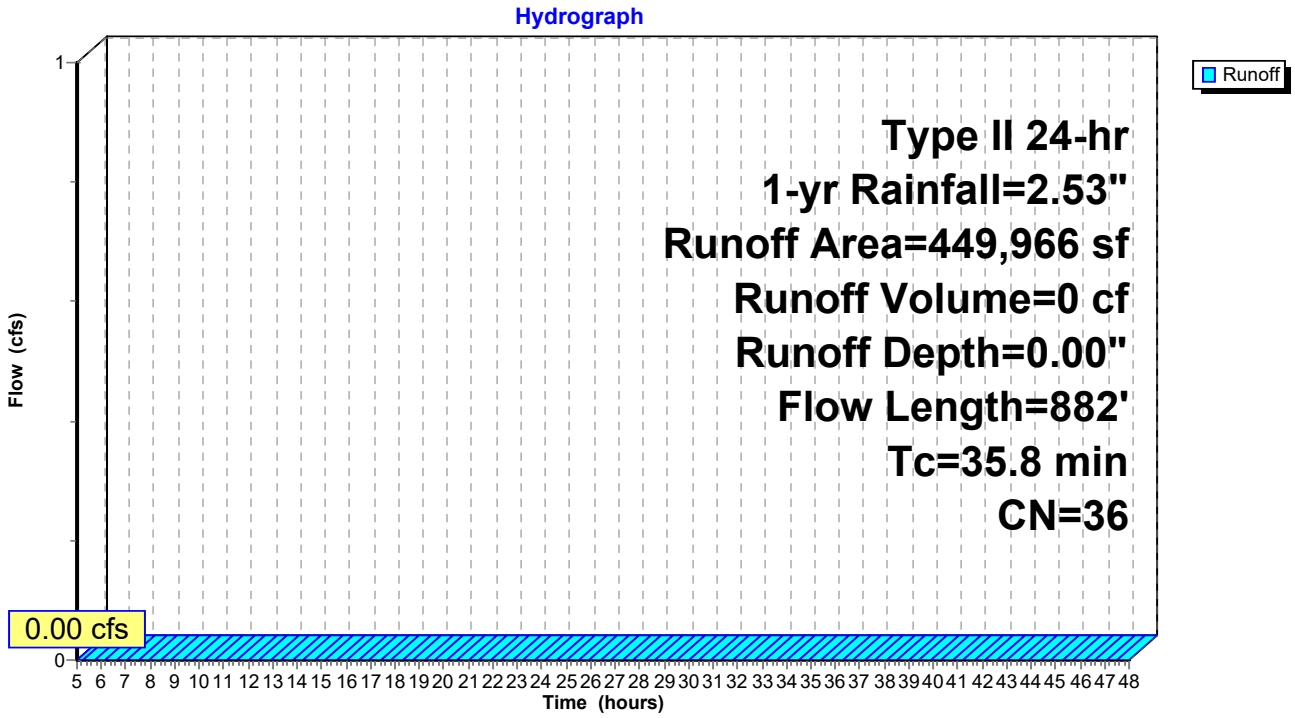
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.53"

	Area (sf)	CN	Description
	251,361	36	Woods, Fair, HSG A
	181,079	30	Meadow, non-grazed, HSG A
*	17,526	89	Gravel
	449,966	36	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 5S:



Hydrograph for Subcatchment 5S:

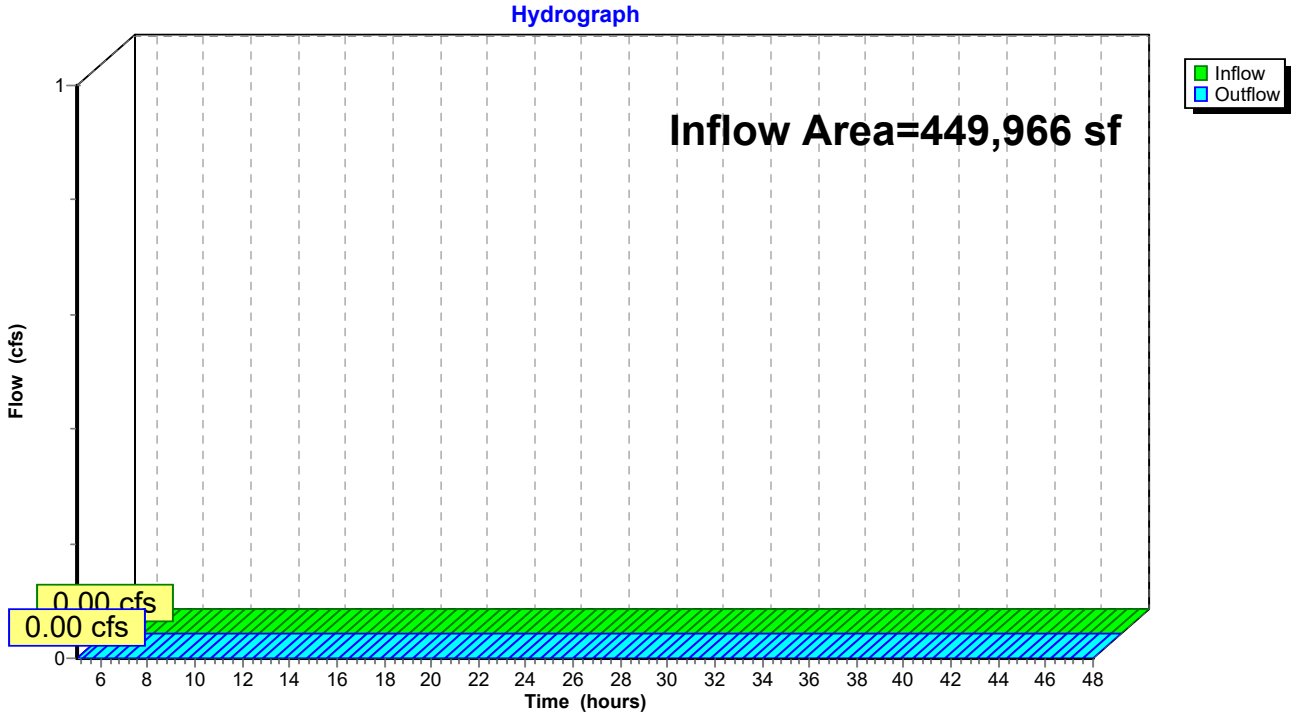
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.16	**0.00**	**0.00**	31.00	2.53	0.00	0.00
5.50	0.18	0.00	0.00	31.50	2.53	0.00	0.00
6.00	0.20	0.00	0.00	32.00	2.53	0.00	0.00
6.50	0.23	0.00	0.00	32.50	2.53	0.00	0.00
7.00	0.25	0.00	0.00	33.00	2.53	0.00	0.00
7.50	0.28	0.00	0.00	33.50	2.53	0.00	0.00
8.00	0.30	0.00	0.00	34.00	2.53	0.00	0.00
8.50	0.33	0.00	0.00	34.50	2.53	0.00	0.00
9.00	0.37	0.00	0.00	35.00	2.53	0.00	0.00
9.50	0.41	0.00	0.00	35.50	2.53	0.00	0.00
10.00	0.46	0.00	0.00	36.00	2.53	0.00	0.00
10.50	0.52	0.00	0.00	36.50	2.53	0.00	0.00
11.00	0.59	0.00	0.00	37.00	2.53	0.00	0.00
11.50	0.72	0.00	0.00	37.50	2.53	0.00	0.00
12.00	1.68	0.00	0.00	38.00	2.53	0.00	0.00
12.50	1.86	0.00	0.00	38.50	2.53	0.00	0.00
13.00	1.95	0.00	0.00	39.00	2.53	0.00	0.00
13.50	2.02	0.00	0.00	39.50	2.53	0.00	0.00
14.00	2.07	0.00	0.00	40.00	2.53	0.00	0.00
14.50	2.12	0.00	0.00	40.50	2.53	0.00	0.00
15.00	2.16	0.00	0.00	41.00	2.53	0.00	0.00
15.50	2.20	0.00	0.00	41.50	2.53	0.00	0.00
16.00	2.23	0.00	0.00	42.00	2.53	0.00	0.00
16.50	2.25	0.00	0.00	42.50	2.53	0.00	0.00
17.00	2.28	0.00	0.00	43.00	2.53	0.00	0.00
17.50	2.31	0.00	0.00	43.50	2.53	0.00	0.00
18.00	2.33	0.00	0.00	44.00	2.53	0.00	0.00
18.50	2.35	0.00	0.00	44.50	2.53	0.00	0.00
19.00	2.37	0.00	0.00	45.00	2.53	0.00	0.00
19.50	2.39	0.00	0.00	45.50	2.53	0.00	0.00
20.00	2.41	0.00	0.00	46.00	2.53	0.00	0.00
20.50	2.42	0.00	0.00	46.50	2.53	0.00	0.00
21.00	2.44	0.00	0.00	47.00	2.53	0.00	0.00
21.50	2.46	0.00	0.00	47.50	2.53	0.00	0.00
22.00	2.47	0.00	0.00	48.00	2.53	0.00	0.00
22.50	2.49	0.00	0.00				
23.00	2.50	0.00	0.00				
23.50	2.52	0.00	0.00				
24.00	**2.53**	0.00	0.00				
24.50	2.53	0.00	0.00				
25.00	2.53	0.00	0.00				
25.50	2.53	0.00	0.00				
26.00	2.53	0.00	0.00				
26.50	2.53	0.00	0.00				
27.00	2.53	0.00	0.00				
27.50	2.53	0.00	0.00				
28.00	2.53	0.00	0.00				
28.50	2.53	0.00	0.00				
29.00	2.53	0.00	0.00				
29.50	2.53	0.00	0.00				
30.00	2.53	0.00	0.00				
30.50	2.53	0.00	0.00				

Summary for Reach 5R: Pre

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 5R: Pre



Hydrograph for Reach 5R: Pre

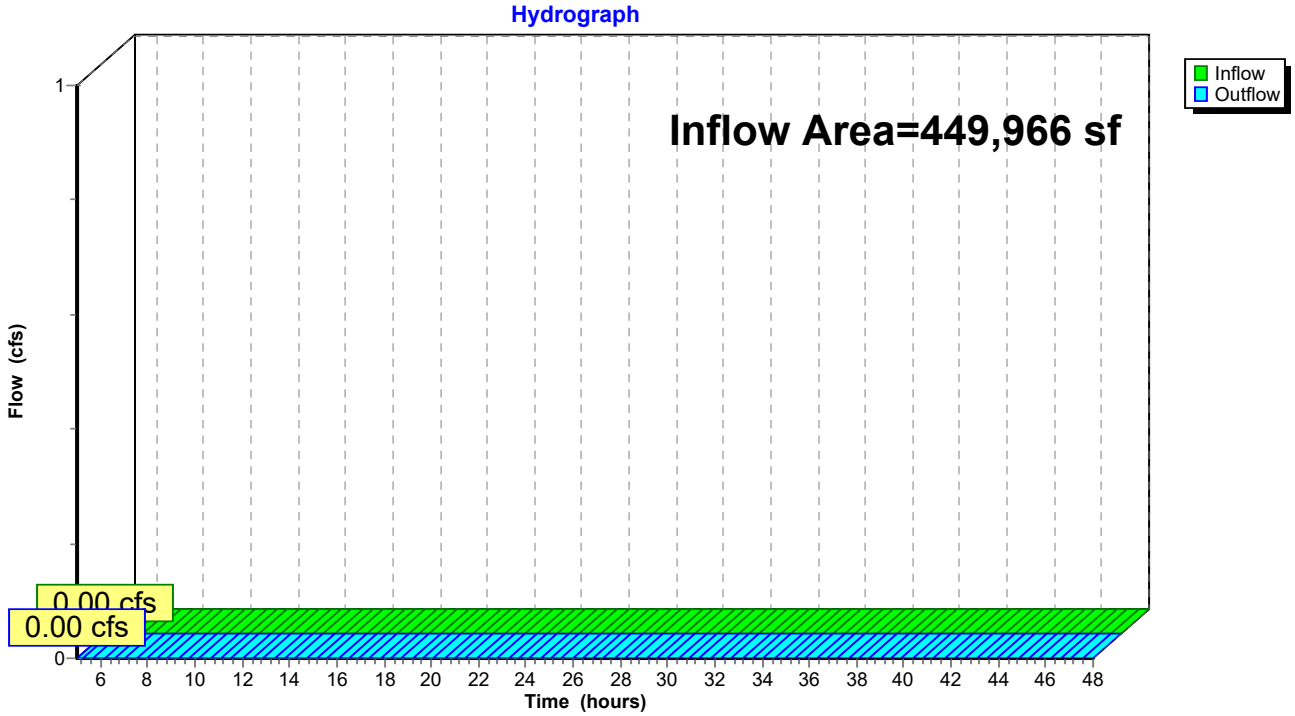
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	**0.00**		**0.00**	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.00		0.00	39.00	0.00		0.00
13.50	0.00		0.00	39.50	0.00		0.00
14.00	0.00		0.00	40.00	0.00		0.00
14.50	0.00		0.00	40.50	0.00		0.00
15.00	0.00		0.00	41.00	0.00		0.00
15.50	0.00		0.00	41.50	0.00		0.00
16.00	0.00		0.00	42.00	0.00		0.00
16.50	0.00		0.00	42.50	0.00		0.00
17.00	0.00		0.00	43.00	0.00		0.00
17.50	0.00		0.00	43.50	0.00		0.00
18.00	0.00		0.00	44.00	0.00		0.00
18.50	0.00		0.00	44.50	0.00		0.00
19.00	0.00		0.00	45.00	0.00		0.00
19.50	0.00		0.00	45.50	0.00		0.00
20.00	0.00		0.00	46.00	0.00		0.00
20.50	0.00		0.00	46.50	0.00		0.00
21.00	0.00		0.00	47.00	0.00		0.00
21.50	0.00		0.00	47.50	0.00		0.00
22.00	0.00		0.00	48.00	0.00		0.00
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Summary for Reach 6R: Post

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 6R: Post



Hydrograph for Reach 6R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	**0.00**		**0.00**	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.00		0.00	39.00	0.00		0.00
13.50	0.00		0.00	39.50	0.00		0.00
14.00	0.00		0.00	40.00	0.00		0.00
14.50	0.00		0.00	40.50	0.00		0.00
15.00	0.00		0.00	41.00	0.00		0.00
15.50	0.00		0.00	41.50	0.00		0.00
16.00	0.00		0.00	42.00	0.00		0.00
16.50	0.00		0.00	42.50	0.00		0.00
17.00	0.00		0.00	43.00	0.00		0.00
17.50	0.00		0.00	43.50	0.00		0.00
18.00	0.00		0.00	44.00	0.00		0.00
18.50	0.00		0.00	44.50	0.00		0.00
19.00	0.00		0.00	45.00	0.00		0.00
19.50	0.00		0.00	45.50	0.00		0.00
20.00	0.00		0.00	46.00	0.00		0.00
20.50	0.00		0.00	46.50	0.00		0.00
21.00	0.00		0.00	47.00	0.00		0.00
21.50	0.00		0.00	47.50	0.00		0.00
22.00	0.00		0.00	48.00	0.00		0.00
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=35.8 min CN=34 Runoff=0.00 cfs 0 cf

Subcatchment 5S: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=35.8 min CN=36 Runoff=0.00 cfs 0 cf

Reach 5R: Pre Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach 6R: Post Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 899,932 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"
100.00% Pervious = 899,932 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1P:

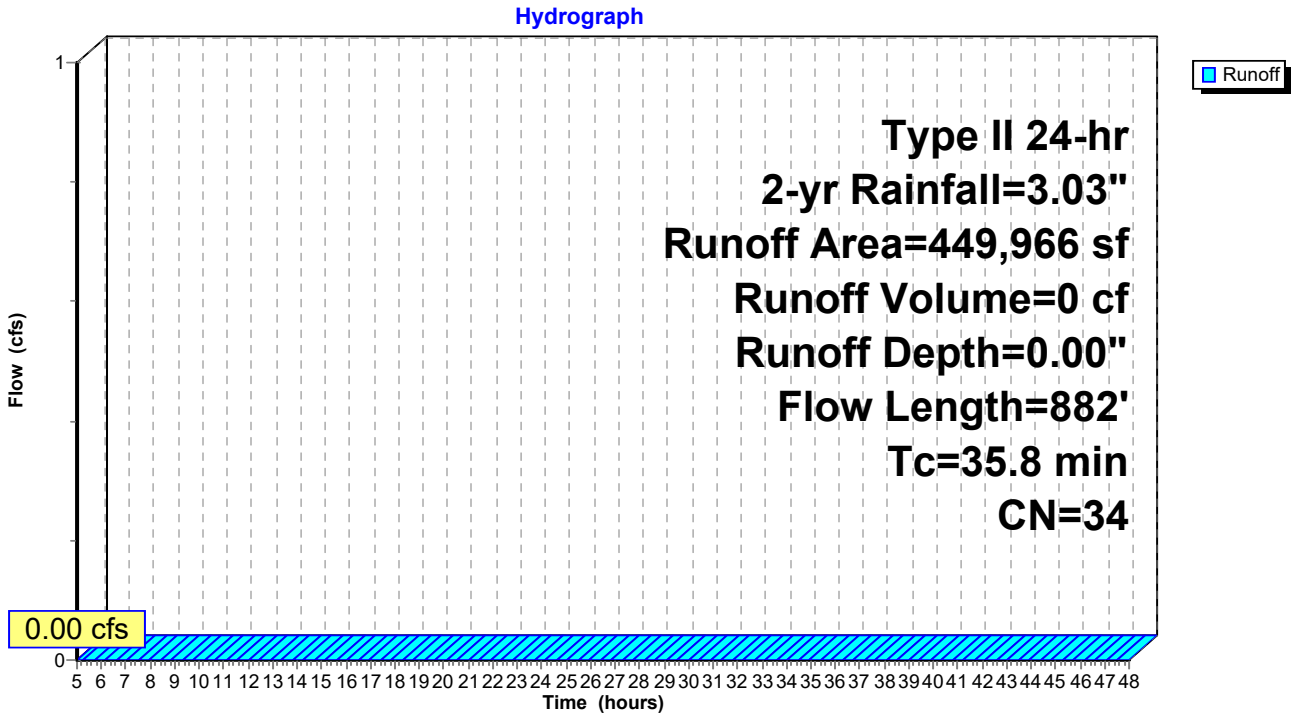
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.03"

	Area (sf)	CN	Description
	258,380	36	Woods, Fair, HSG A
	189,629	30	Meadow, non-grazed, HSG A
*	1,957	89	Gravel
	449,966	34	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 1P:



Hydrograph for Subcatchment 1P:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.19	**0.00**	**0.00**	31.00	3.03	0.00	0.00
5.50	0.22	0.00	0.00	31.50	3.03	0.00	0.00
6.00	0.24	0.00	0.00	32.00	3.03	0.00	0.00
6.50	0.27	0.00	0.00	32.50	3.03	0.00	0.00
7.00	0.30	0.00	0.00	33.00	3.03	0.00	0.00
7.50	0.33	0.00	0.00	33.50	3.03	0.00	0.00
8.00	0.36	0.00	0.00	34.00	3.03	0.00	0.00
8.50	0.40	0.00	0.00	34.50	3.03	0.00	0.00
9.00	0.45	0.00	0.00	35.00	3.03	0.00	0.00
9.50	0.49	0.00	0.00	35.50	3.03	0.00	0.00
10.00	0.55	0.00	0.00	36.00	3.03	0.00	0.00
10.50	0.62	0.00	0.00	36.50	3.03	0.00	0.00
11.00	0.71	0.00	0.00	37.00	3.03	0.00	0.00
11.50	0.86	0.00	0.00	37.50	3.03	0.00	0.00
12.00	2.01	0.00	0.00	38.00	3.03	0.00	0.00
12.50	2.23	0.00	0.00	38.50	3.03	0.00	0.00
13.00	2.34	0.00	0.00	39.00	3.03	0.00	0.00
13.50	2.42	0.00	0.00	39.50	3.03	0.00	0.00
14.00	2.48	0.00	0.00	40.00	3.03	0.00	0.00
14.50	2.54	0.00	0.00	40.50	3.03	0.00	0.00
15.00	2.59	0.00	0.00	41.00	3.03	0.00	0.00
15.50	2.63	0.00	0.00	41.50	3.03	0.00	0.00
16.00	2.67	0.00	0.00	42.00	3.03	0.00	0.00
16.50	2.70	0.00	0.00	42.50	3.03	0.00	0.00
17.00	2.73	0.00	0.00	43.00	3.03	0.00	0.00
17.50	2.76	0.00	0.00	43.50	3.03	0.00	0.00
18.00	2.79	0.00	0.00	44.00	3.03	0.00	0.00
18.50	2.82	0.00	0.00	44.50	3.03	0.00	0.00
19.00	2.84	0.00	0.00	45.00	3.03	0.00	0.00
19.50	2.86	0.00	0.00	45.50	3.03	0.00	0.00
20.00	2.88	0.00	0.00	46.00	3.03	0.00	0.00
20.50	2.90	0.00	0.00	46.50	3.03	0.00	0.00
21.00	2.92	0.00	0.00	47.00	3.03	0.00	0.00
21.50	2.94	0.00	0.00	47.50	3.03	0.00	0.00
22.00	2.96	0.00	0.00	48.00	3.03	0.00	0.00
22.50	2.98	0.00	0.00				
23.00	3.00	0.00	0.00				
23.50	3.01	0.00	0.00				
24.00	**3.03**	0.00	0.00				
24.50	3.03	0.00	0.00				
25.00	3.03	0.00	0.00				
25.50	3.03	0.00	0.00				
26.00	3.03	0.00	0.00				
26.50	3.03	0.00	0.00				
27.00	3.03	0.00	0.00				
27.50	3.03	0.00	0.00				
28.00	3.03	0.00	0.00				
28.50	3.03	0.00	0.00				
29.00	3.03	0.00	0.00				
29.50	3.03	0.00	0.00				
30.00	3.03	0.00	0.00				
30.50	3.03	0.00	0.00				

Summary for Subcatchment 5S:

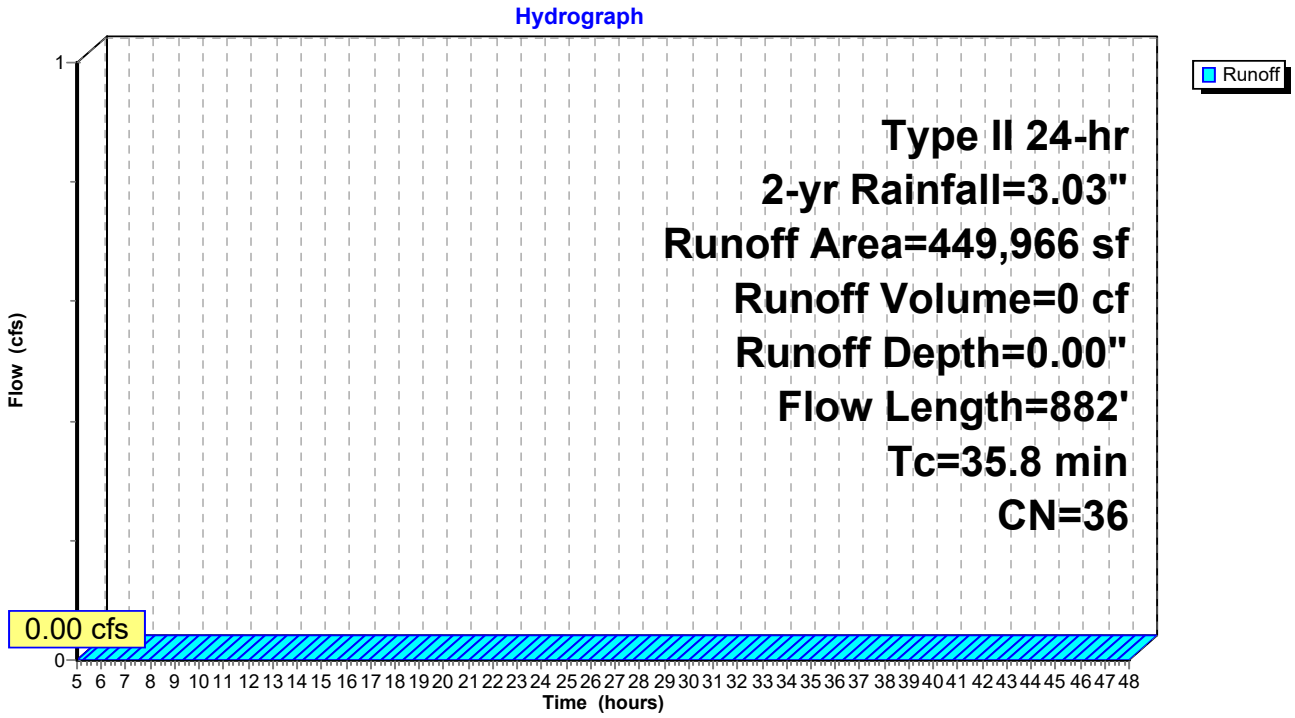
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.03"

	Area (sf)	CN	Description
	251,361	36	Woods, Fair, HSG A
	181,079	30	Meadow, non-grazed, HSG A
*	17,526	89	Gravel
	449,966	36	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 5S:



Hydrograph for Subcatchment 5S:

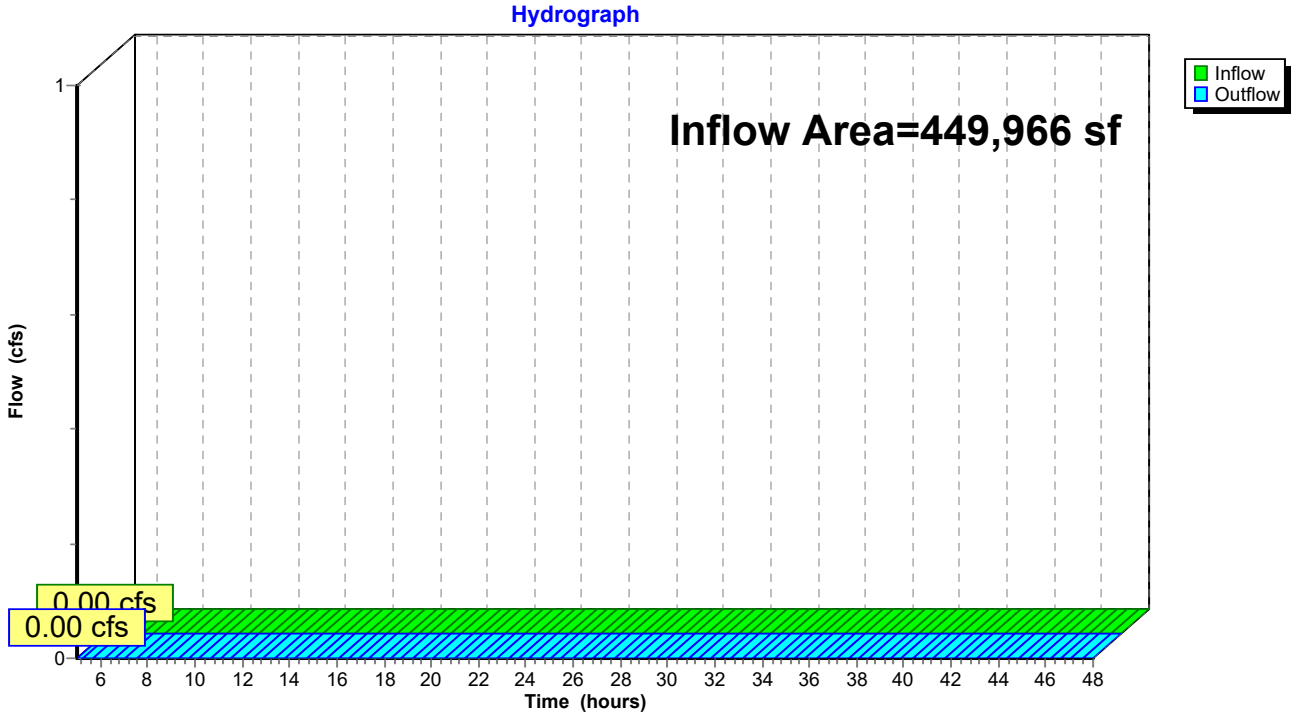
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.19	**0.00**	**0.00**	31.00	3.03	0.00	0.00
5.50	0.22	0.00	0.00	31.50	3.03	0.00	0.00
6.00	0.24	0.00	0.00	32.00	3.03	0.00	0.00
6.50	0.27	0.00	0.00	32.50	3.03	0.00	0.00
7.00	0.30	0.00	0.00	33.00	3.03	0.00	0.00
7.50	0.33	0.00	0.00	33.50	3.03	0.00	0.00
8.00	0.36	0.00	0.00	34.00	3.03	0.00	0.00
8.50	0.40	0.00	0.00	34.50	3.03	0.00	0.00
9.00	0.45	0.00	0.00	35.00	3.03	0.00	0.00
9.50	0.49	0.00	0.00	35.50	3.03	0.00	0.00
10.00	0.55	0.00	0.00	36.00	3.03	0.00	0.00
10.50	0.62	0.00	0.00	36.50	3.03	0.00	0.00
11.00	0.71	0.00	0.00	37.00	3.03	0.00	0.00
11.50	0.86	0.00	0.00	37.50	3.03	0.00	0.00
12.00	2.01	0.00	0.00	38.00	3.03	0.00	0.00
12.50	2.23	0.00	0.00	38.50	3.03	0.00	0.00
13.00	2.34	0.00	0.00	39.00	3.03	0.00	0.00
13.50	2.42	0.00	0.00	39.50	3.03	0.00	0.00
14.00	2.48	0.00	0.00	40.00	3.03	0.00	0.00
14.50	2.54	0.00	0.00	40.50	3.03	0.00	0.00
15.00	2.59	0.00	0.00	41.00	3.03	0.00	0.00
15.50	2.63	0.00	0.00	41.50	3.03	0.00	0.00
16.00	2.67	0.00	0.00	42.00	3.03	0.00	0.00
16.50	2.70	0.00	0.00	42.50	3.03	0.00	0.00
17.00	2.73	0.00	0.00	43.00	3.03	0.00	0.00
17.50	2.76	0.00	0.00	43.50	3.03	0.00	0.00
18.00	2.79	0.00	0.00	44.00	3.03	0.00	0.00
18.50	2.82	0.00	0.00	44.50	3.03	0.00	0.00
19.00	2.84	0.00	0.00	45.00	3.03	0.00	0.00
19.50	2.86	0.00	0.00	45.50	3.03	0.00	0.00
20.00	2.88	0.00	0.00	46.00	3.03	0.00	0.00
20.50	2.90	0.00	0.00	46.50	3.03	0.00	0.00
21.00	2.92	0.00	0.00	47.00	3.03	0.00	0.00
21.50	2.94	0.00	0.00	47.50	3.03	0.00	0.00
22.00	2.96	0.00	0.00	48.00	3.03	0.00	0.00
22.50	2.98	0.00	0.00				
23.00	3.00	0.00	0.00				
23.50	3.01	0.00	0.00				
24.00	**3.03**	0.00	0.00				
24.50	3.03	0.00	0.00				
25.00	3.03	0.00	0.00				
25.50	3.03	0.00	0.00				
26.00	3.03	0.00	0.00				
26.50	3.03	0.00	0.00				
27.00	3.03	0.00	0.00				
27.50	3.03	0.00	0.00				
28.00	3.03	0.00	0.00				
28.50	3.03	0.00	0.00				
29.00	3.03	0.00	0.00				
29.50	3.03	0.00	0.00				
30.00	3.03	0.00	0.00				
30.50	3.03	0.00	0.00				

Summary for Reach 5R: Pre

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 5R: Pre



Hydrograph for Reach 5R: Pre

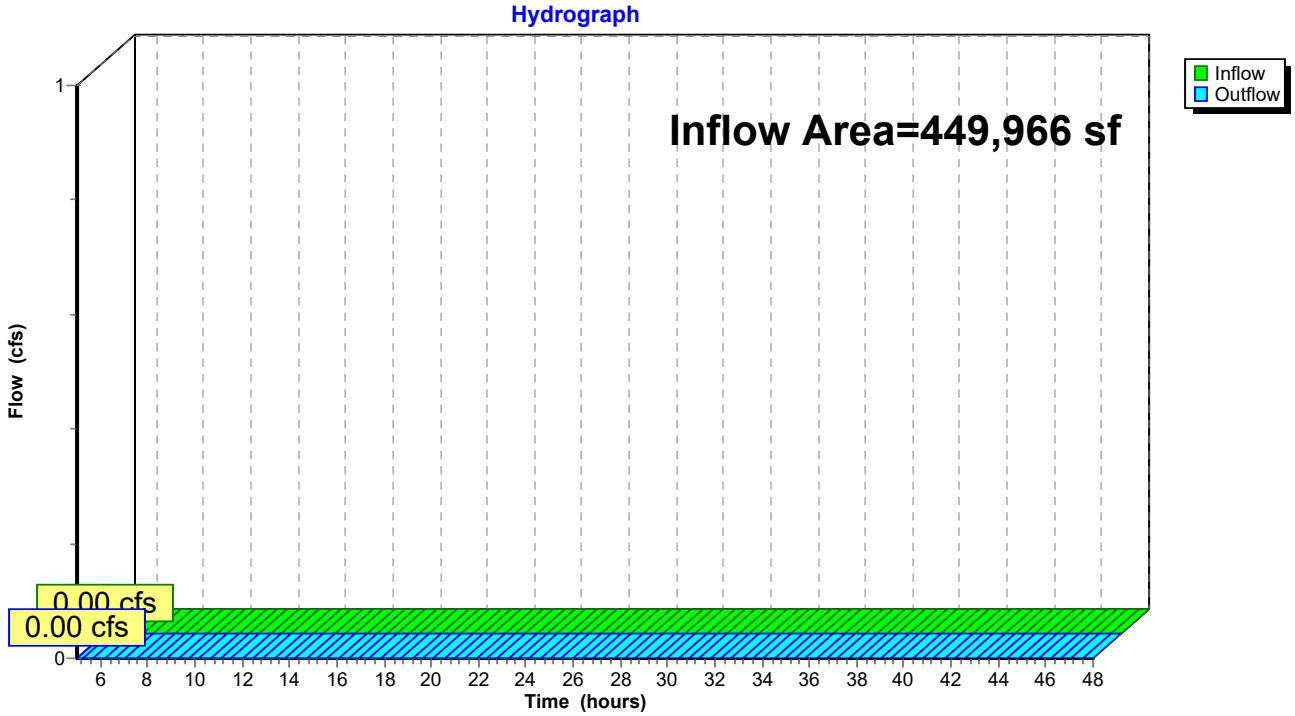
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	**0.00**		**0.00**	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.00		0.00	39.00	0.00		0.00
13.50	0.00		0.00	39.50	0.00		0.00
14.00	0.00		0.00	40.00	0.00		0.00
14.50	0.00		0.00	40.50	0.00		0.00
15.00	0.00		0.00	41.00	0.00		0.00
15.50	0.00		0.00	41.50	0.00		0.00
16.00	0.00		0.00	42.00	0.00		0.00
16.50	0.00		0.00	42.50	0.00		0.00
17.00	0.00		0.00	43.00	0.00		0.00
17.50	0.00		0.00	43.50	0.00		0.00
18.00	0.00		0.00	44.00	0.00		0.00
18.50	0.00		0.00	44.50	0.00		0.00
19.00	0.00		0.00	45.00	0.00		0.00
19.50	0.00		0.00	45.50	0.00		0.00
20.00	0.00		0.00	46.00	0.00		0.00
20.50	0.00		0.00	46.50	0.00		0.00
21.00	0.00		0.00	47.00	0.00		0.00
21.50	0.00		0.00	47.50	0.00		0.00
22.00	0.00		0.00	48.00	0.00		0.00
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Summary for Reach 6R: Post

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 6R: Post



Hydrograph for Reach 6R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	**0.00**		**0.00**	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.00		0.00	39.00	0.00		0.00
13.50	0.00		0.00	39.50	0.00		0.00
14.00	0.00		0.00	40.00	0.00		0.00
14.50	0.00		0.00	40.50	0.00		0.00
15.00	0.00		0.00	41.00	0.00		0.00
15.50	0.00		0.00	41.50	0.00		0.00
16.00	0.00		0.00	42.00	0.00		0.00
16.50	0.00		0.00	42.50	0.00		0.00
17.00	0.00		0.00	43.00	0.00		0.00
17.50	0.00		0.00	43.50	0.00		0.00
18.00	0.00		0.00	44.00	0.00		0.00
18.50	0.00		0.00	44.50	0.00		0.00
19.00	0.00		0.00	45.00	0.00		0.00
19.50	0.00		0.00	45.50	0.00		0.00
20.00	0.00		0.00	46.00	0.00		0.00
20.50	0.00		0.00	46.50	0.00		0.00
21.00	0.00		0.00	47.00	0.00		0.00
21.50	0.00		0.00	47.50	0.00		0.00
22.00	0.00		0.00	48.00	0.00		0.00
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=35.8 min CN=34 Runoff=0.00 cfs 0 cf

Subcatchment 5S: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=35.8 min CN=36 Runoff=0.01 cfs 71 cf

Reach 5R: Pre Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach 6R: Post Inflow=0.01 cfs 71 cf
Outflow=0.01 cfs 71 cf

Total Runoff Area = 899,932 sf Runoff Volume = 71 cf Average Runoff Depth = 0.00"
100.00% Pervious = 899,932 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1P:

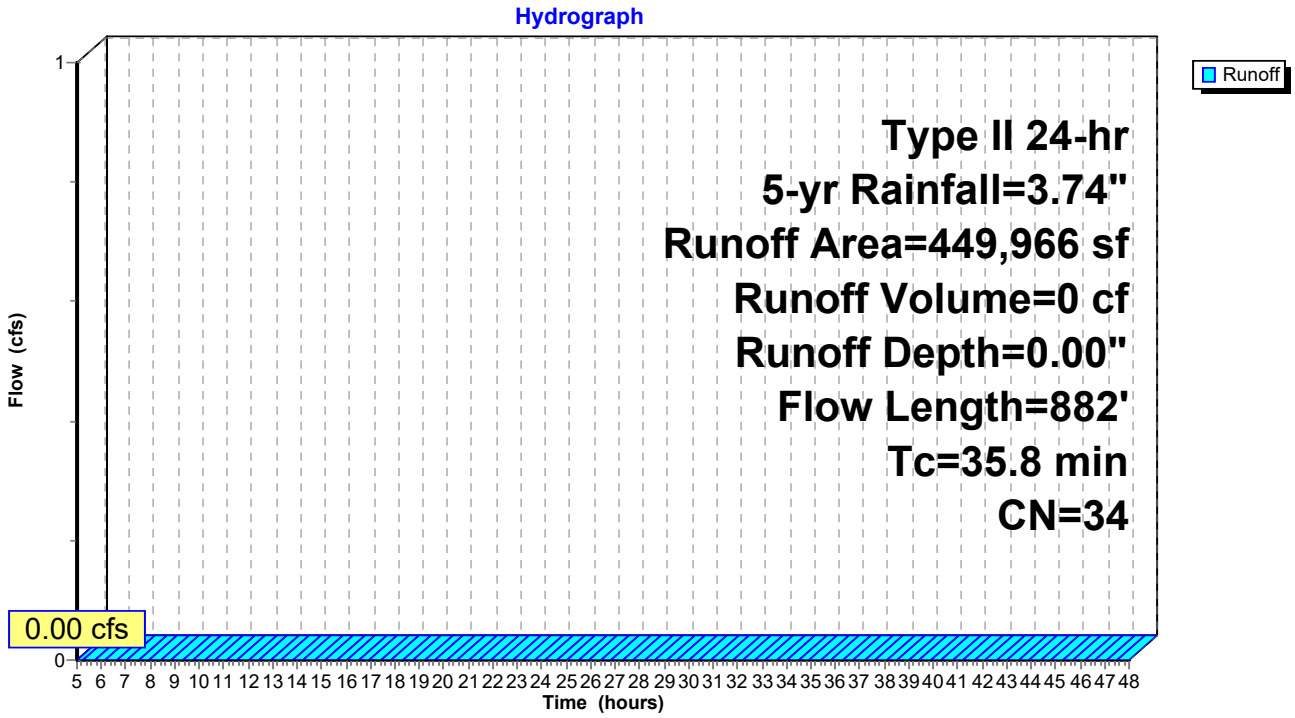
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-yr Rainfall=3.74"

	Area (sf)	CN	Description
	258,380	36	Woods, Fair, HSG A
	189,629	30	Meadow, non-grazed, HSG A
*	1,957	89	Gravel
	449,966	34	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 1P:



Hydrograph for Subcatchment 1P:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.24	**0.00**	**0.00**	31.00	3.74	0.00	0.00
5.50	0.27	0.00	0.00	31.50	3.74	0.00	0.00
6.00	0.30	0.00	0.00	32.00	3.74	0.00	0.00
6.50	0.33	0.00	0.00	32.50	3.74	0.00	0.00
7.00	0.37	0.00	0.00	33.00	3.74	0.00	0.00
7.50	0.41	0.00	0.00	33.50	3.74	0.00	0.00
8.00	0.45	0.00	0.00	34.00	3.74	0.00	0.00
8.50	0.49	0.00	0.00	34.50	3.74	0.00	0.00
9.00	0.55	0.00	0.00	35.00	3.74	0.00	0.00
9.50	0.61	0.00	0.00	35.50	3.74	0.00	0.00
10.00	0.68	0.00	0.00	36.00	3.74	0.00	0.00
10.50	0.76	0.00	0.00	36.50	3.74	0.00	0.00
11.00	0.88	0.00	0.00	37.00	3.74	0.00	0.00
11.50	1.06	0.00	0.00	37.50	3.74	0.00	0.00
12.00	2.48	0.00	0.00	38.00	3.74	0.00	0.00
12.50	2.75	0.00	0.00	38.50	3.74	0.00	0.00
13.00	2.89	0.00	0.00	39.00	3.74	0.00	0.00
13.50	2.99	0.00	0.00	39.50	3.74	0.00	0.00
14.00	3.07	0.00	0.00	40.00	3.74	0.00	0.00
14.50	3.13	0.00	0.00	40.50	3.74	0.00	0.00
15.00	3.19	0.00	0.00	41.00	3.74	0.00	0.00
15.50	3.24	0.00	0.00	41.50	3.74	0.00	0.00
16.00	3.29	0.00	0.00	42.00	3.74	0.00	0.00
16.50	3.33	0.00	0.00	42.50	3.74	0.00	0.00
17.00	3.37	0.00	0.00	43.00	3.74	0.00	0.00
17.50	3.41	0.00	0.00	43.50	3.74	0.00	0.00
18.00	3.44	0.00	0.00	44.00	3.74	0.00	0.00
18.50	3.48	0.00	0.00	44.50	3.74	0.00	0.00
19.00	3.51	0.00	0.00	45.00	3.74	0.00	0.00
19.50	3.54	0.00	0.00	45.50	3.74	0.00	0.00
20.00	3.56	0.00	0.00	46.00	3.74	0.00	0.00
20.50	3.58	0.00	0.00	46.50	3.74	0.00	0.00
21.00	3.61	0.00	0.00	47.00	3.74	0.00	0.00
21.50	3.63	0.00	0.00	47.50	3.74	0.00	0.00
22.00	3.65	0.00	0.00	48.00	3.74	0.00	0.00
22.50	3.68	0.00	0.00				
23.00	3.70	0.00	0.00				
23.50	3.72	0.00	0.00				
24.00	**3.74**	0.00	0.00				
24.50	3.74	0.00	0.00				
25.00	3.74	0.00	0.00				
25.50	3.74	0.00	0.00				
26.00	3.74	0.00	0.00				
26.50	3.74	0.00	0.00				
27.00	3.74	0.00	0.00				
27.50	3.74	0.00	0.00				
28.00	3.74	0.00	0.00				
28.50	3.74	0.00	0.00				
29.00	3.74	0.00	0.00				
29.50	3.74	0.00	0.00				
30.00	3.74	0.00	0.00				
30.50	3.74	0.00	0.00				

Summary for Subcatchment 5S:

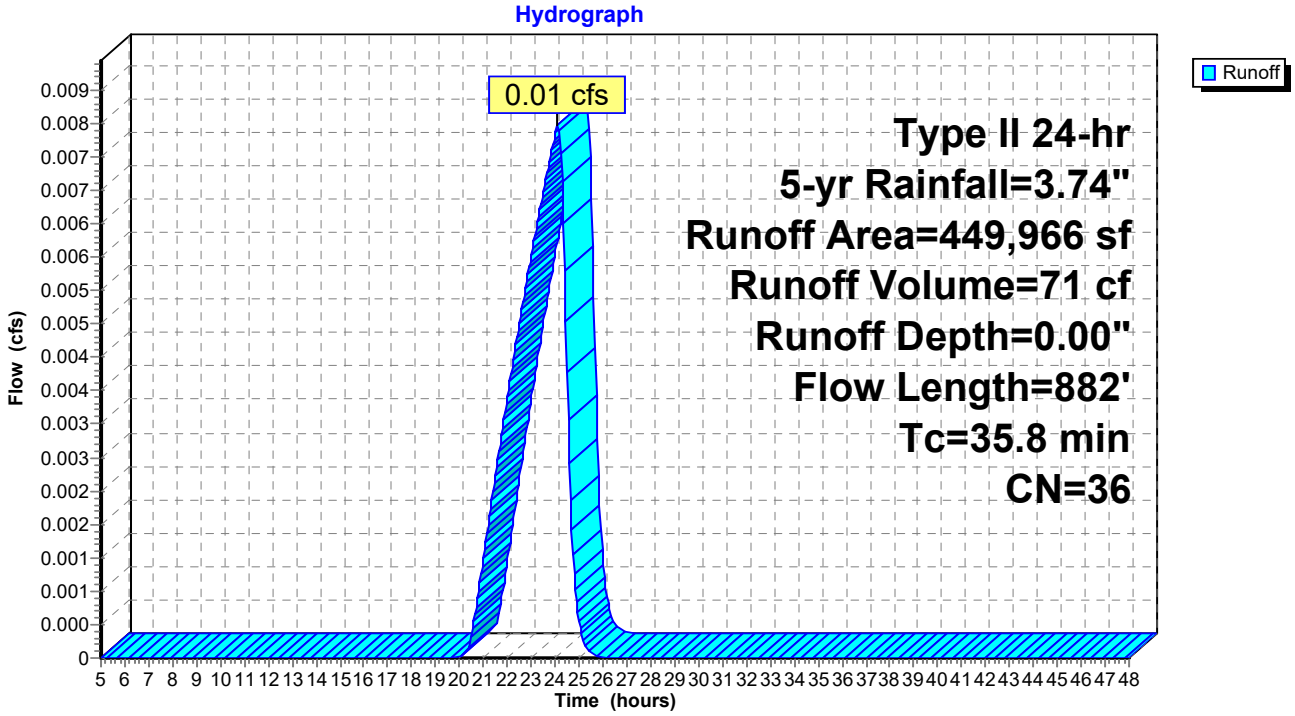
Runoff = 0.01 cfs @ 24.11 hrs, Volume= 71 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-yr Rainfall=3.74"

	Area (sf)	CN	Description
	251,361	36	Woods, Fair, HSG A
	181,079	30	Meadow, non-grazed, HSG A
*	17,526	89	Gravel
	449,966	36	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 5S:



Hydrograph for Subcatchment 5S:

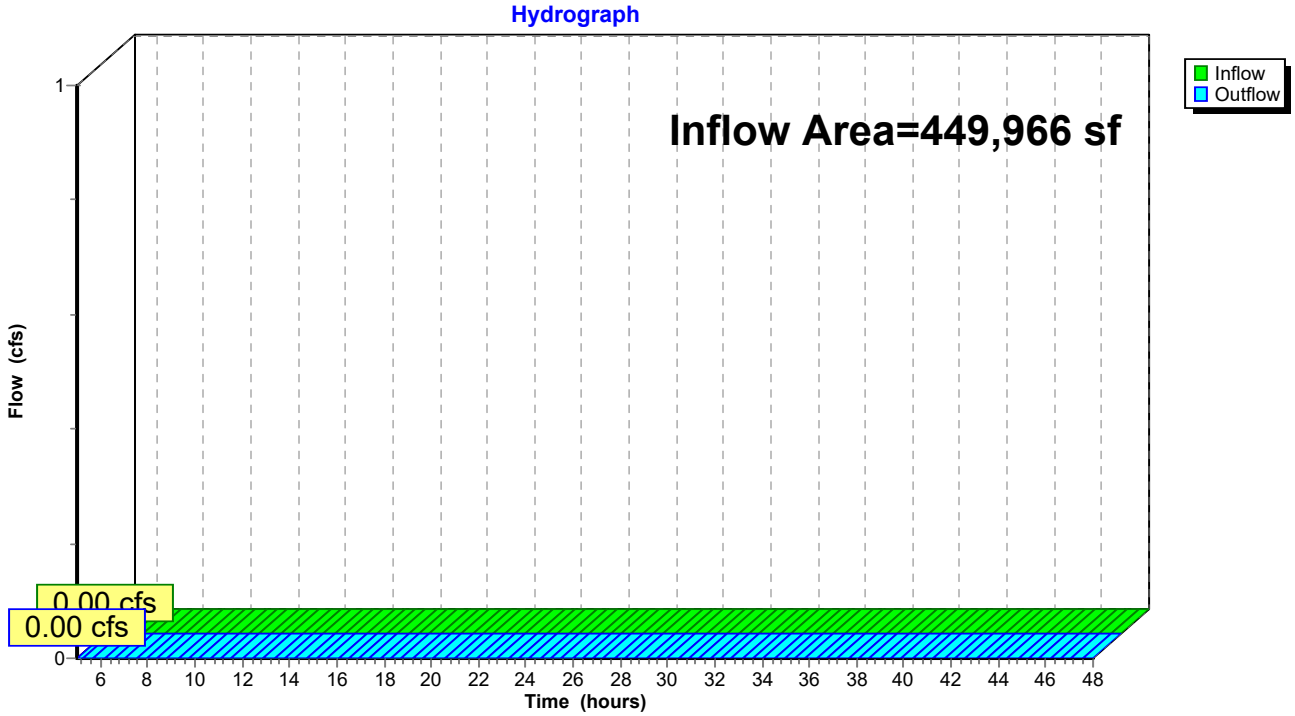
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.24	0.00	0.00	31.00	3.74	0.00	0.00
5.50	0.27	0.00	0.00	31.50	3.74	0.00	0.00
6.00	0.30	0.00	0.00	32.00	3.74	0.00	0.00
6.50	0.33	0.00	0.00	32.50	3.74	0.00	0.00
7.00	0.37	0.00	0.00	33.00	3.74	0.00	0.00
7.50	0.41	0.00	0.00	33.50	3.74	0.00	0.00
8.00	0.45	0.00	0.00	34.00	3.74	0.00	0.00
8.50	0.49	0.00	0.00	34.50	3.74	0.00	0.00
9.00	0.55	0.00	0.00	35.00	3.74	0.00	0.00
9.50	0.61	0.00	0.00	35.50	3.74	0.00	0.00
10.00	0.68	0.00	0.00	36.00	3.74	0.00	0.00
10.50	0.76	0.00	0.00	36.50	3.74	0.00	0.00
11.00	0.88	0.00	0.00	37.00	3.74	0.00	0.00
11.50	1.06	0.00	0.00	37.50	3.74	0.00	0.00
12.00	2.48	0.00	0.00	38.00	3.74	0.00	0.00
12.50	2.75	0.00	0.00	38.50	3.74	0.00	0.00
13.00	2.89	0.00	0.00	39.00	3.74	0.00	0.00
13.50	2.99	0.00	0.00	39.50	3.74	0.00	0.00
14.00	3.07	0.00	0.00	40.00	3.74	0.00	0.00
14.50	3.13	0.00	0.00	40.50	3.74	0.00	0.00
15.00	3.19	0.00	0.00	41.00	3.74	0.00	0.00
15.50	3.24	0.00	0.00	41.50	3.74	0.00	0.00
16.00	3.29	0.00	0.00	42.00	3.74	0.00	0.00
16.50	3.33	0.00	0.00	42.50	3.74	0.00	0.00
17.00	3.37	0.00	0.00	43.00	3.74	0.00	0.00
17.50	3.41	0.00	0.00	43.50	3.74	0.00	0.00
18.00	3.44	0.00	0.00	44.00	3.74	0.00	0.00
18.50	3.48	0.00	0.00	44.50	3.74	0.00	0.00
19.00	3.51	0.00	0.00	45.00	3.74	0.00	0.00
19.50	3.54	0.00	0.00	45.50	3.74	0.00	0.00
20.00	3.56	0.00	0.00	46.00	3.74	0.00	0.00
20.50	3.58	0.00	0.00	46.50	3.74	0.00	0.00
21.00	3.61	0.00	0.00	47.00	3.74	0.00	0.00
21.50	3.63	0.00	0.00	47.50	3.74	0.00	0.00
22.00	3.65	0.00	0.00	48.00	3.74	0.00	0.00
22.50	3.68	0.00	0.01				
23.00	3.70	0.00	0.01				
23.50	3.72	0.00	0.01				
24.00	**3.74**	**0.00**	**0.01**				
24.50	3.74	0.00	**0.00**				
25.00	3.74	0.00	0.00				
25.50	3.74	0.00	0.00				
26.00	3.74	0.00	0.00				
26.50	3.74	0.00	0.00				
27.00	3.74	0.00	0.00				
27.50	3.74	0.00	0.00				
28.00	3.74	0.00	0.00				
28.50	3.74	0.00	0.00				
29.00	3.74	0.00	0.00				
29.50	3.74	0.00	0.00				
30.00	3.74	0.00	0.00				
30.50	3.74	0.00	0.00				

Summary for Reach 5R: Pre

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 5-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 5R: Pre



Hydrograph for Reach 5R: Pre

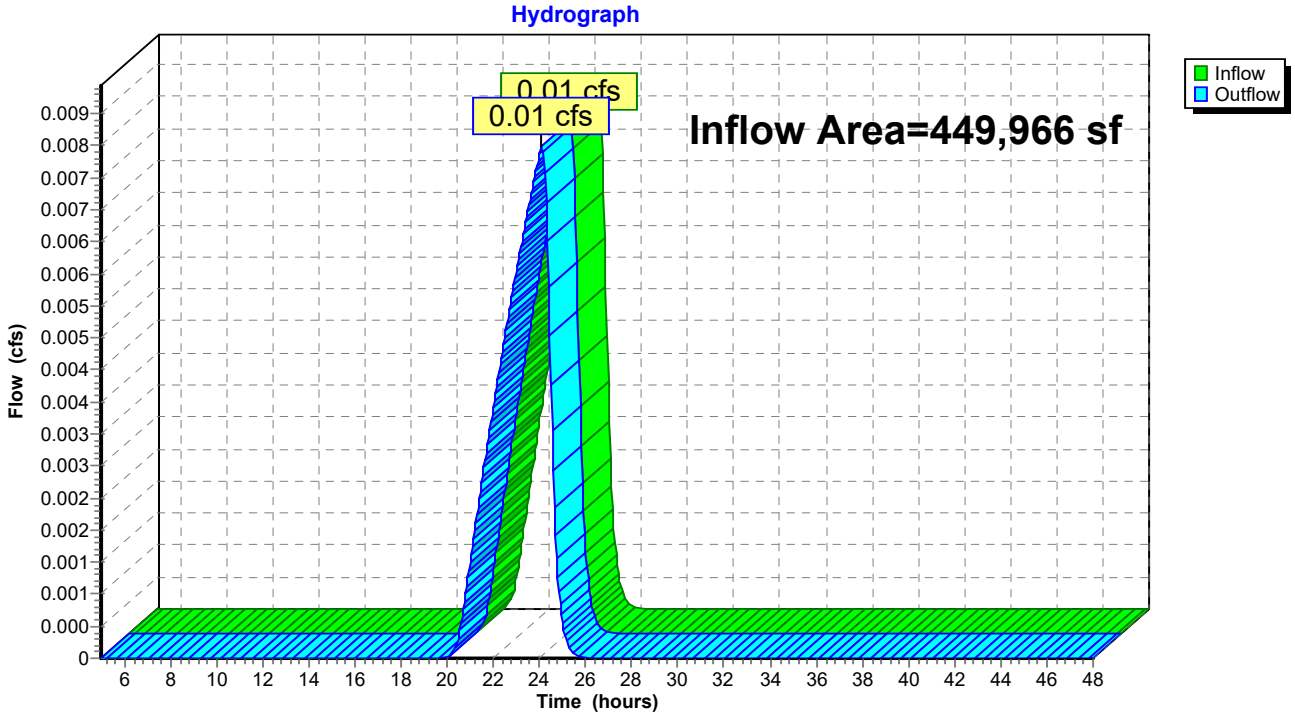
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	**0.00**		**0.00**	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.00		0.00	39.00	0.00		0.00
13.50	0.00		0.00	39.50	0.00		0.00
14.00	0.00		0.00	40.00	0.00		0.00
14.50	0.00		0.00	40.50	0.00		0.00
15.00	0.00		0.00	41.00	0.00		0.00
15.50	0.00		0.00	41.50	0.00		0.00
16.00	0.00		0.00	42.00	0.00		0.00
16.50	0.00		0.00	42.50	0.00		0.00
17.00	0.00		0.00	43.00	0.00		0.00
17.50	0.00		0.00	43.50	0.00		0.00
18.00	0.00		0.00	44.00	0.00		0.00
18.50	0.00		0.00	44.50	0.00		0.00
19.00	0.00		0.00	45.00	0.00		0.00
19.50	0.00		0.00	45.50	0.00		0.00
20.00	0.00		0.00	46.00	0.00		0.00
20.50	0.00		0.00	46.50	0.00		0.00
21.00	0.00		0.00	47.00	0.00		0.00
21.50	0.00		0.00	47.50	0.00		0.00
22.00	0.00		0.00	48.00	0.00		0.00
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Summary for Reach 6R: Post

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 5-yr event
Inflow = 0.01 cfs @ 24.11 hrs, Volume= 71 cf
Outflow = 0.01 cfs @ 24.11 hrs, Volume= 71 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 6R: Post



Hydrograph for Reach 6R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.00		0.00	39.00	0.00		0.00
13.50	0.00		0.00	39.50	0.00		0.00
14.00	0.00		0.00	40.00	0.00		0.00
14.50	0.00		0.00	40.50	0.00		0.00
15.00	0.00		0.00	41.00	0.00		0.00
15.50	0.00		0.00	41.50	0.00		0.00
16.00	0.00		0.00	42.00	0.00		0.00
16.50	0.00		0.00	42.50	0.00		0.00
17.00	0.00		0.00	43.00	0.00		0.00
17.50	0.00		0.00	43.50	0.00		0.00
18.00	0.00		0.00	44.00	0.00		0.00
18.50	0.00		0.00	44.50	0.00		0.00
19.00	0.00		0.00	45.00	0.00		0.00
19.50	0.00		0.00	45.50	0.00		0.00
20.00	0.00		0.00	46.00	0.00		0.00
20.50	0.00		0.00	46.50	0.00		0.00
21.00	0.00		0.00	47.00	0.00		0.00
21.50	0.00		0.00	47.50	0.00		0.00
22.00	0.00		0.00	48.00	0.00		0.00
22.50	0.01		0.01				
23.00	0.01		0.01				
23.50	0.01		0.01				
24.00	**0.01**		**0.01**				
24.50	**0.00**		**0.00**				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=882' Tc=35.8 min CN=34 Runoff=0.02 cfs 413 cf

Subcatchment 5S: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=882' Tc=35.8 min CN=36 Runoff=0.04 cfs 1,274 cf

Reach 5R: Pre Inflow=0.02 cfs 413 cf
Outflow=0.02 cfs 413 cf

Reach 6R: Post Inflow=0.04 cfs 1,274 cf
Outflow=0.04 cfs 1,274 cf

Total Runoff Area = 899,932 sf Runoff Volume = 1,687 cf Average Runoff Depth = 0.02"
100.00% Pervious = 899,932 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1P:

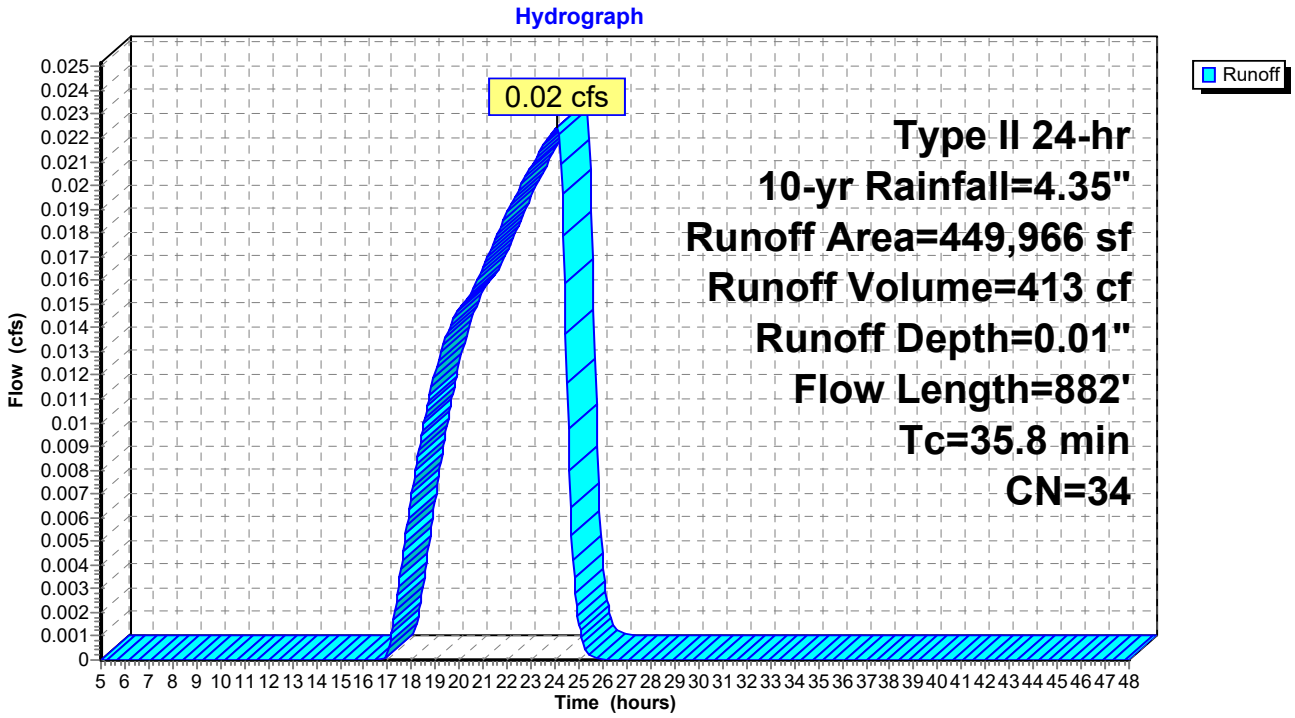
Runoff = 0.02 cfs @ 24.06 hrs, Volume= 413 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.35"

	Area (sf)	CN	Description
	258,380	36	Woods, Fair, HSG A
	189,629	30	Meadow, non-grazed, HSG A
*	1,957	89	Gravel
	449,966	34	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 1P:



Hydrograph for Subcatchment 1P:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00	31.00	4.35	0.01	0.00
5.50	0.31	0.00	0.00	31.50	4.35	0.01	0.00
6.00	0.35	0.00	0.00	32.00	4.35	0.01	0.00
6.50	0.39	0.00	0.00	32.50	4.35	0.01	0.00
7.00	0.43	0.00	0.00	33.00	4.35	0.01	0.00
7.50	0.48	0.00	0.00	33.50	4.35	0.01	0.00
8.00	0.52	0.00	0.00	34.00	4.35	0.01	0.00
8.50	0.58	0.00	0.00	34.50	4.35	0.01	0.00
9.00	0.64	0.00	0.00	35.00	4.35	0.01	0.00
9.50	0.71	0.00	0.00	35.50	4.35	0.01	0.00
10.00	0.79	0.00	0.00	36.00	4.35	0.01	0.00
10.50	0.89	0.00	0.00	36.50	4.35	0.01	0.00
11.00	1.02	0.00	0.00	37.00	4.35	0.01	0.00
11.50	1.23	0.00	0.00	37.50	4.35	0.01	0.00
12.00	2.88	0.00	0.00	38.00	4.35	0.01	0.00
12.50	3.20	0.00	0.00	38.50	4.35	0.01	0.00
13.00	3.36	0.00	0.00	39.00	4.35	0.01	0.00
13.50	3.48	0.00	0.00	39.50	4.35	0.01	0.00
14.00	3.57	0.00	0.00	40.00	4.35	0.01	0.00
14.50	3.64	0.00	0.00	40.50	4.35	0.01	0.00
15.00	3.71	0.00	0.00	41.00	4.35	0.01	0.00
15.50	3.77	0.00	0.00	41.50	4.35	0.01	0.00
16.00	3.83	0.00	0.00	42.00	4.35	0.01	0.00
16.50	3.88	0.00	0.00	42.50	4.35	0.01	0.00
17.00	3.92	0.00	0.00	43.00	4.35	0.01	0.00
17.50	3.97	0.00	0.00	43.50	4.35	0.01	0.00
18.00	4.01	0.00	0.01	44.00	4.35	0.01	0.00
18.50	4.04	0.00	0.01	44.50	4.35	0.01	0.00
19.00	4.08	0.00	0.01	45.00	4.35	0.01	0.00
19.50	4.11	0.00	0.01	45.50	4.35	0.01	0.00
20.00	4.14	0.00	0.01	46.00	4.35	0.01	0.00
20.50	4.17	0.00	0.02	46.50	4.35	0.01	0.00
21.00	4.20	0.01	0.02	47.00	4.35	0.01	0.00
21.50	4.22	0.01	0.02	47.50	4.35	0.01	0.00
22.00	4.25	0.01	0.02	48.00	4.35	0.01	0.00
22.50	4.28	0.01	0.02				
23.00	4.30	0.01	0.02				
23.50	4.33	0.01	0.02				
24.00	**4.35**	**0.01**	**0.02**				
24.50	4.35	0.01	**0.01**				
25.00	4.35	0.01	0.00				
25.50	4.35	0.01	0.00				
26.00	4.35	0.01	0.00				
26.50	4.35	0.01	0.00				
27.00	4.35	0.01	0.00				
27.50	4.35	0.01	0.00				
28.00	4.35	0.01	0.00				
28.50	4.35	0.01	0.00				
29.00	4.35	0.01	0.00				
29.50	4.35	0.01	0.00				
30.00	4.35	0.01	0.00				
30.50	4.35	0.01	0.00				

Summary for Subcatchment 5S:

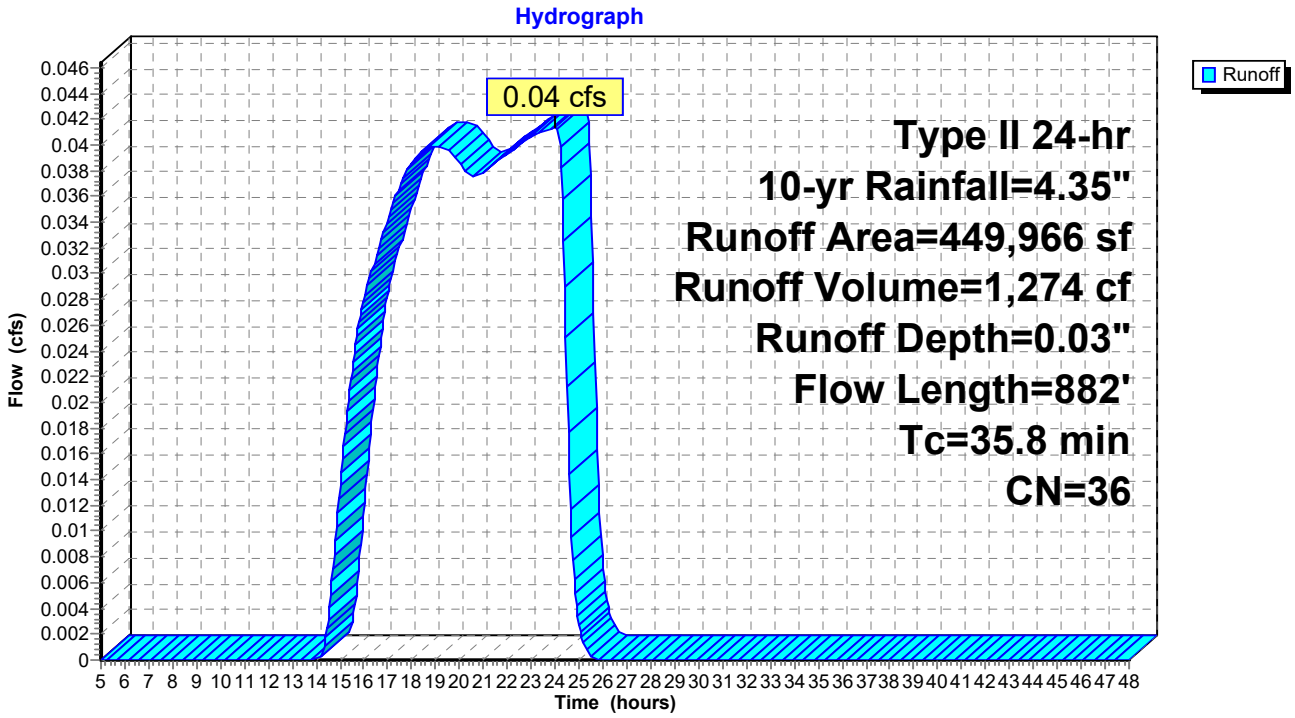
Runoff = 0.04 cfs @ 24.02 hrs, Volume= 1,274 cf, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.35"

	Area (sf)	CN	Description
	251,361	36	Woods, Fair, HSG A
	181,079	30	Meadow, non-grazed, HSG A
*	17,526	89	Gravel
	449,966	36	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 5S:



Hydrograph for Subcatchment 5S:

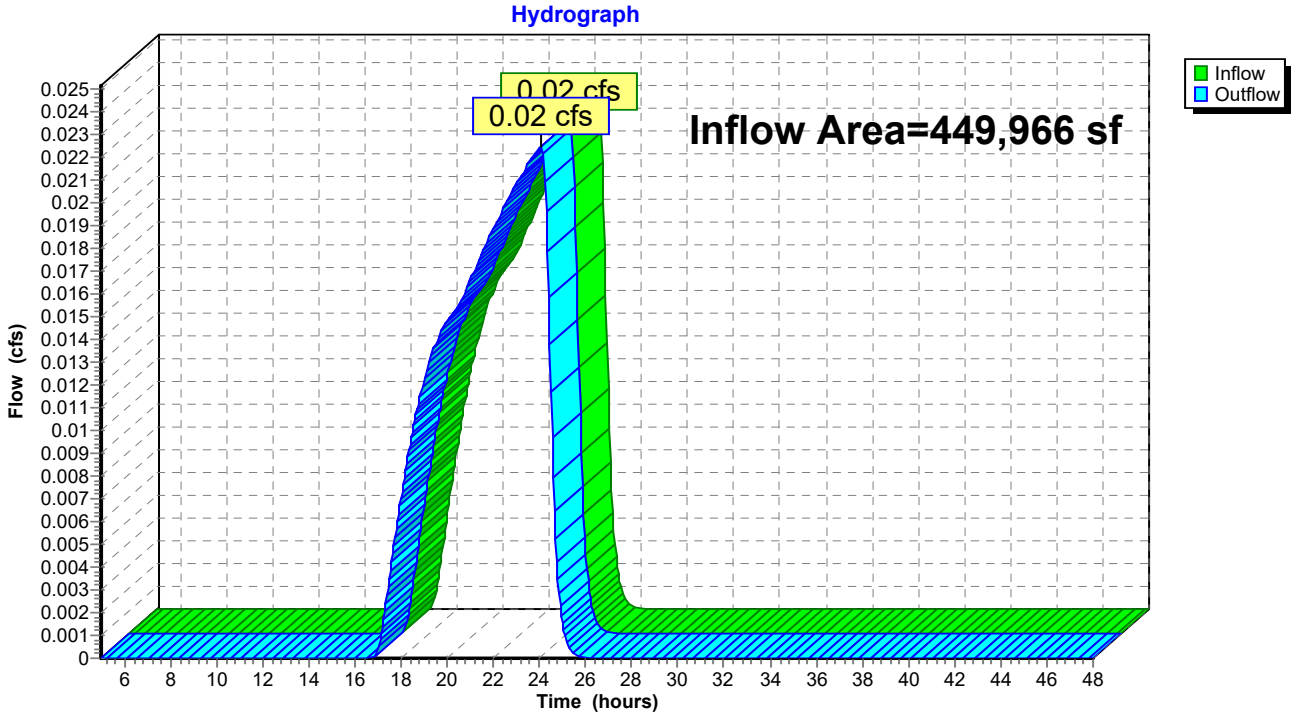
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00	31.00	4.35	0.03	0.00
5.50	0.31	0.00	0.00	31.50	4.35	0.03	0.00
6.00	0.35	0.00	0.00	32.00	4.35	0.03	0.00
6.50	0.39	0.00	0.00	32.50	4.35	0.03	0.00
7.00	0.43	0.00	0.00	33.00	4.35	0.03	0.00
7.50	0.48	0.00	0.00	33.50	4.35	0.03	0.00
8.00	0.52	0.00	0.00	34.00	4.35	0.03	0.00
8.50	0.58	0.00	0.00	34.50	4.35	0.03	0.00
9.00	0.64	0.00	0.00	35.00	4.35	0.03	0.00
9.50	0.71	0.00	0.00	35.50	4.35	0.03	0.00
10.00	0.79	0.00	0.00	36.00	4.35	0.03	0.00
10.50	0.89	0.00	0.00	36.50	4.35	0.03	0.00
11.00	1.02	0.00	0.00	37.00	4.35	0.03	0.00
11.50	1.23	0.00	0.00	37.50	4.35	0.03	0.00
12.00	2.88	0.00	0.00	38.00	4.35	0.03	0.00
12.50	3.20	0.00	0.00	38.50	4.35	0.03	0.00
13.00	3.36	0.00	0.00	39.00	4.35	0.03	0.00
13.50	3.48	0.00	0.00	39.50	4.35	0.03	0.00
14.00	3.57	0.00	0.00	40.00	4.35	0.03	0.00
14.50	3.64	0.00	0.00	40.50	4.35	0.03	0.00
15.00	3.71	0.00	0.01	41.00	4.35	0.03	0.00
15.50	3.77	0.00	0.02	41.50	4.35	0.03	0.00
16.00	3.83	0.00	0.03	42.00	4.35	0.03	0.00
16.50	3.88	0.01	0.03	42.50	4.35	0.03	0.00
17.00	3.92	0.01	0.03	43.00	4.35	0.03	0.00
17.50	3.97	0.01	0.04	43.50	4.35	0.03	0.00
18.00	4.01	0.01	0.04	44.00	4.35	0.03	0.00
18.50	4.04	0.01	0.04	44.50	4.35	0.03	0.00
19.00	4.08	0.01	0.04	45.00	4.35	0.03	0.00
19.50	4.11	0.02	0.04	45.50	4.35	0.03	0.00
20.00	4.14	0.02	0.04	46.00	4.35	0.03	0.00
20.50	4.17	0.02	0.04	46.50	4.35	0.03	0.00
21.00	4.20	0.02	0.04	47.00	4.35	0.03	0.00
21.50	4.22	0.02	0.04	47.50	4.35	0.03	0.00
22.00	4.25	0.03	0.04	48.00	4.35	0.03	0.00
22.50	4.28	0.03	0.04				
23.00	4.30	0.03	0.04				
23.50	4.33	0.03	0.04				
24.00	**4.35**	**0.03**	**0.04**				
24.50	4.35	0.03	0.02				
25.00	4.35	0.03	0.00				
25.50	4.35	0.03	0.00				
26.00	4.35	0.03	0.00				
26.50	4.35	0.03	0.00				
27.00	4.35	0.03	0.00				
27.50	4.35	0.03	0.00				
28.00	4.35	0.03	0.00				
28.50	4.35	0.03	0.00				
29.00	4.35	0.03	0.00				
29.50	4.35	0.03	0.00				
30.00	4.35	0.03	0.00				
30.50	4.35	0.03	0.00				

Summary for Reach 5R: Pre

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.01" for 10-yr event
Inflow = 0.02 cfs @ 24.06 hrs, Volume= 413 cf
Outflow = 0.02 cfs @ 24.06 hrs, Volume= 413 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 5R: Pre



Hydrograph for Reach 5R: Pre

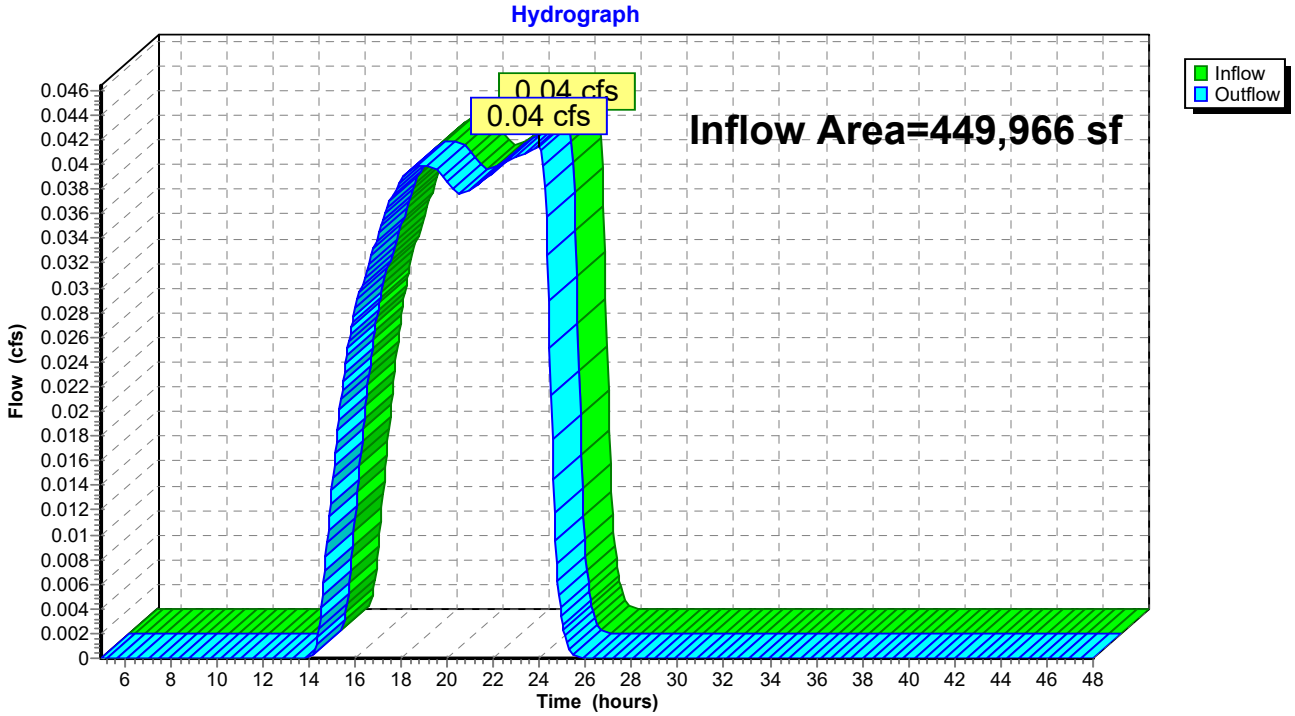
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.00		0.00	39.00	0.00		0.00
13.50	0.00		0.00	39.50	0.00		0.00
14.00	0.00		0.00	40.00	0.00		0.00
14.50	0.00		0.00	40.50	0.00		0.00
15.00	0.00		0.00	41.00	0.00		0.00
15.50	0.00		0.00	41.50	0.00		0.00
16.00	0.00		0.00	42.00	0.00		0.00
16.50	0.00		0.00	42.50	0.00		0.00
17.00	0.00		0.00	43.00	0.00		0.00
17.50	0.00		0.00	43.50	0.00		0.00
18.00	0.01		0.01	44.00	0.00		0.00
18.50	0.01		0.01	44.50	0.00		0.00
19.00	0.01		0.01	45.00	0.00		0.00
19.50	0.01		0.01	45.50	0.00		0.00
20.00	0.01		0.01	46.00	0.00		0.00
20.50	0.02		0.02	46.50	0.00		0.00
21.00	0.02		0.02	47.00	0.00		0.00
21.50	0.02		0.02	47.50	0.00		0.00
22.00	0.02		0.02	48.00	0.00		0.00
22.50	0.02		0.02				
23.00	0.02		0.02				
23.50	0.02		0.02				
24.00	**0.02**		**0.02**				
24.50	**0.01**		**0.01**				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Summary for Reach 6R: Post

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.03" for 10-yr event
Inflow = 0.04 cfs @ 24.02 hrs, Volume= 1,274 cf
Outflow = 0.04 cfs @ 24.02 hrs, Volume= 1,274 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 6R: Post



Hydrograph for Reach 6R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.00		0.00	39.00	0.00		0.00
13.50	0.00		0.00	39.50	0.00		0.00
14.00	0.00		0.00	40.00	0.00		0.00
14.50	0.00		0.00	40.50	0.00		0.00
15.00	0.01		0.01	41.00	0.00		0.00
15.50	0.02		0.02	41.50	0.00		0.00
16.00	0.03		0.03	42.00	0.00		0.00
16.50	0.03		0.03	42.50	0.00		0.00
17.00	0.03		0.03	43.00	0.00		0.00
17.50	0.04		0.04	43.50	0.00		0.00
18.00	0.04		0.04	44.00	0.00		0.00
18.50	0.04		0.04	44.50	0.00		0.00
19.00	0.04		0.04	45.00	0.00		0.00
19.50	0.04		0.04	45.50	0.00		0.00
20.00	0.04		0.04	46.00	0.00		0.00
20.50	0.04		0.04	46.50	0.00		0.00
21.00	0.04		0.04	47.00	0.00		0.00
21.50	0.04		0.04	47.50	0.00		0.00
22.00	0.04		0.04	48.00	0.00		0.00
22.50	0.04		0.04				
23.00	0.04		0.04				
23.50	0.04		0.04				
24.00	**0.04**		**0.04**				
24.50	0.02		0.02				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=882' Tc=35.8 min CN=34 Runoff=0.10 cfs 3,520 cf

Subcatchment 5S: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.15"
Flow Length=882' Tc=35.8 min CN=36 Runoff=0.19 cfs 5,718 cf

Reach 5R: Pre Inflow=0.10 cfs 3,520 cf
Outflow=0.10 cfs 3,520 cf

Reach 6R: Post Inflow=0.19 cfs 5,718 cf
Outflow=0.19 cfs 5,718 cf

Total Runoff Area = 899,932 sf Runoff Volume = 9,238 cf Average Runoff Depth = 0.12"
100.00% Pervious = 899,932 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1P:

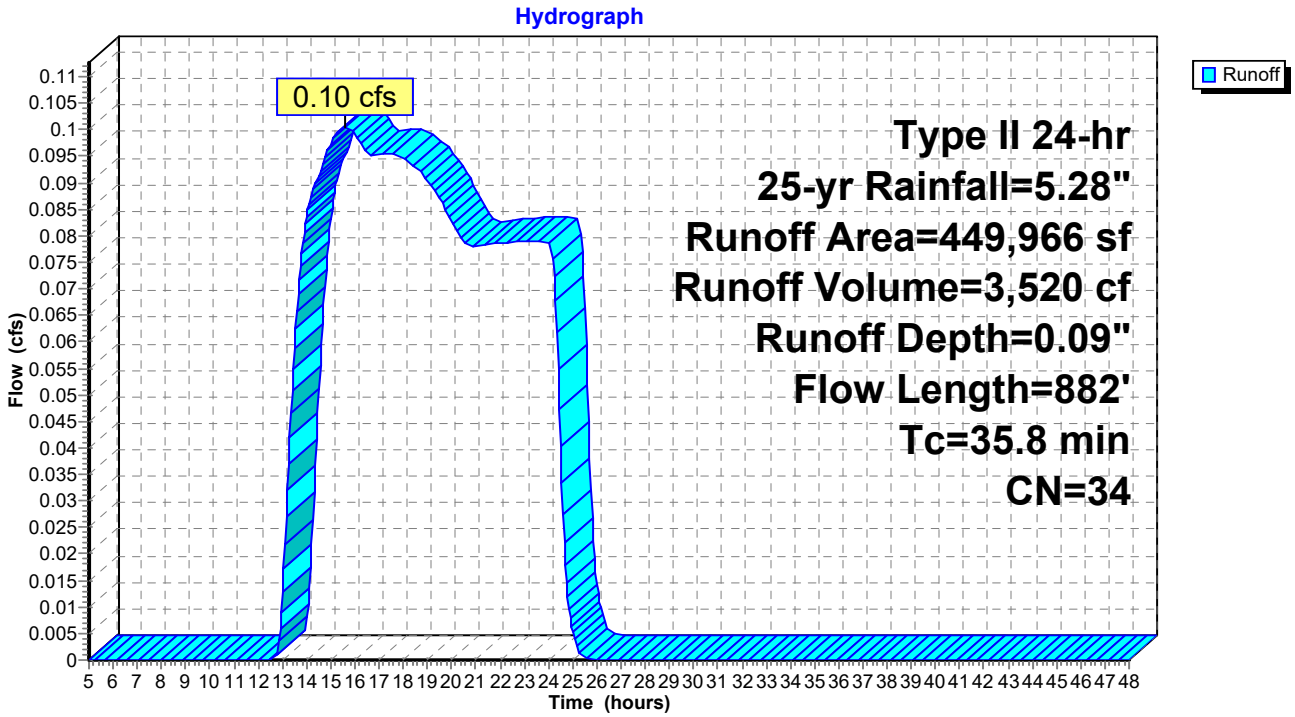
Runoff = 0.10 cfs @ 15.56 hrs, Volume= 3,520 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.28"

	Area (sf)	CN	Description
	258,380	36	Woods, Fair, HSG A
	189,629	30	Meadow, non-grazed, HSG A
*	1,957	89	Gravel
	449,966	34	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 1P:



Hydrograph for Subcatchment 1P:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.33	0.00	0.00	31.00	5.28	0.09	0.00
5.50	0.38	0.00	0.00	31.50	5.28	0.09	0.00
6.00	0.42	0.00	0.00	32.00	5.28	0.09	0.00
6.50	0.47	0.00	0.00	32.50	5.28	0.09	0.00
7.00	0.52	0.00	0.00	33.00	5.28	0.09	0.00
7.50	0.58	0.00	0.00	33.50	5.28	0.09	0.00
8.00	0.63	0.00	0.00	34.00	5.28	0.09	0.00
8.50	0.70	0.00	0.00	34.50	5.28	0.09	0.00
9.00	0.78	0.00	0.00	35.00	5.28	0.09	0.00
9.50	0.86	0.00	0.00	35.50	5.28	0.09	0.00
10.00	0.96	0.00	0.00	36.00	5.28	0.09	0.00
10.50	1.08	0.00	0.00	36.50	5.28	0.09	0.00
11.00	1.24	0.00	0.00	37.00	5.28	0.09	0.00
11.50	1.49	0.00	0.00	37.50	5.28	0.09	0.00
12.00	3.50	0.00	0.00	38.00	5.28	0.09	0.00
12.50	3.88	0.00	0.00	38.50	5.28	0.09	0.00
13.00	4.08	0.00	0.01	39.00	5.28	0.09	0.00
13.50	4.22	0.01	0.06	39.50	5.28	0.09	0.00
14.00	4.33	0.01	0.08	40.00	5.28	0.09	0.00
14.50	4.42	0.01	0.09	40.50	5.28	0.09	0.00
15.00	4.51	0.02	0.10	41.00	5.28	0.09	0.00
15.50	4.58	0.02	**0.10**	41.50	5.28	0.09	0.00
16.00	4.65	0.03	**0.10**	42.00	5.28	0.09	0.00
16.50	4.71	0.03	0.10	42.50	5.28	0.09	0.00
17.00	4.76	0.04	0.10	43.00	5.28	0.09	0.00
17.50	4.81	0.04	0.10	43.50	5.28	0.09	0.00
18.00	4.86	0.05	0.09	44.00	5.28	0.09	0.00
18.50	4.91	0.05	0.09	44.50	5.28	0.09	0.00
19.00	4.95	0.06	0.09	45.00	5.28	0.09	0.00
19.50	4.99	0.06	0.09	45.50	5.28	0.09	0.00
20.00	5.03	0.06	0.08	46.00	5.28	0.09	0.00
20.50	5.06	0.07	0.08	46.50	5.28	0.09	0.00
21.00	5.09	0.07	0.08	47.00	5.28	0.09	0.00
21.50	5.13	0.07	0.08	47.50	5.28	0.09	0.00
22.00	5.16	0.08	0.08	48.00	5.28	0.09	0.00
22.50	5.19	0.08	0.08				
23.00	5.22	0.09	0.08				
23.50	5.25	0.09	0.08				
24.00	**5.28**	**0.09**	0.08				
24.50	5.28	0.09	0.04				
25.00	5.28	0.09	0.01				
25.50	5.28	0.09	0.00				
26.00	5.28	0.09	0.00				
26.50	5.28	0.09	0.00				
27.00	5.28	0.09	0.00				
27.50	5.28	0.09	0.00				
28.00	5.28	0.09	0.00				
28.50	5.28	0.09	0.00				
29.00	5.28	0.09	0.00				
29.50	5.28	0.09	0.00				
30.00	5.28	0.09	0.00				
30.50	5.28	0.09	0.00				

Summary for Subcatchment 5S:

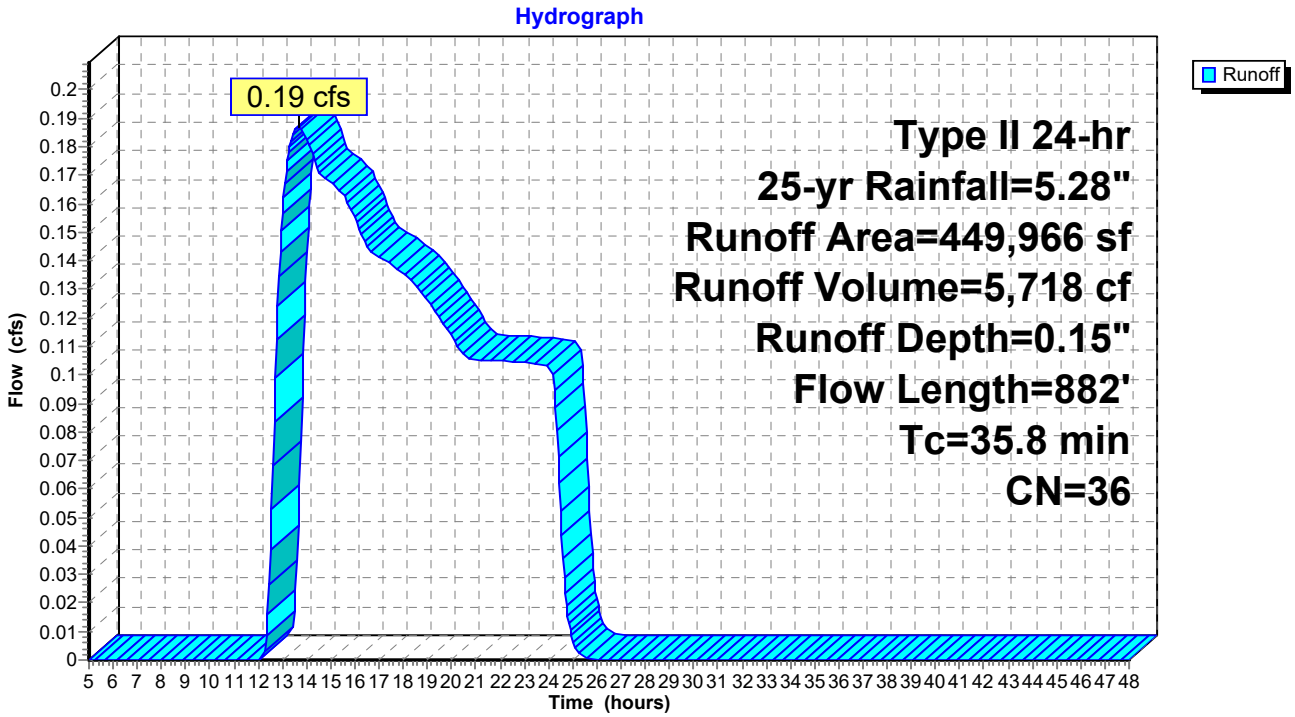
Runoff = 0.19 cfs @ 13.67 hrs, Volume= 5,718 cf, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.28"

	Area (sf)	CN	Description
	251,361	36	Woods, Fair, HSG A
	181,079	30	Meadow, non-grazed, HSG A
*	17,526	89	Gravel
	449,966	36	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 5S:



Hydrograph for Subcatchment 5S:

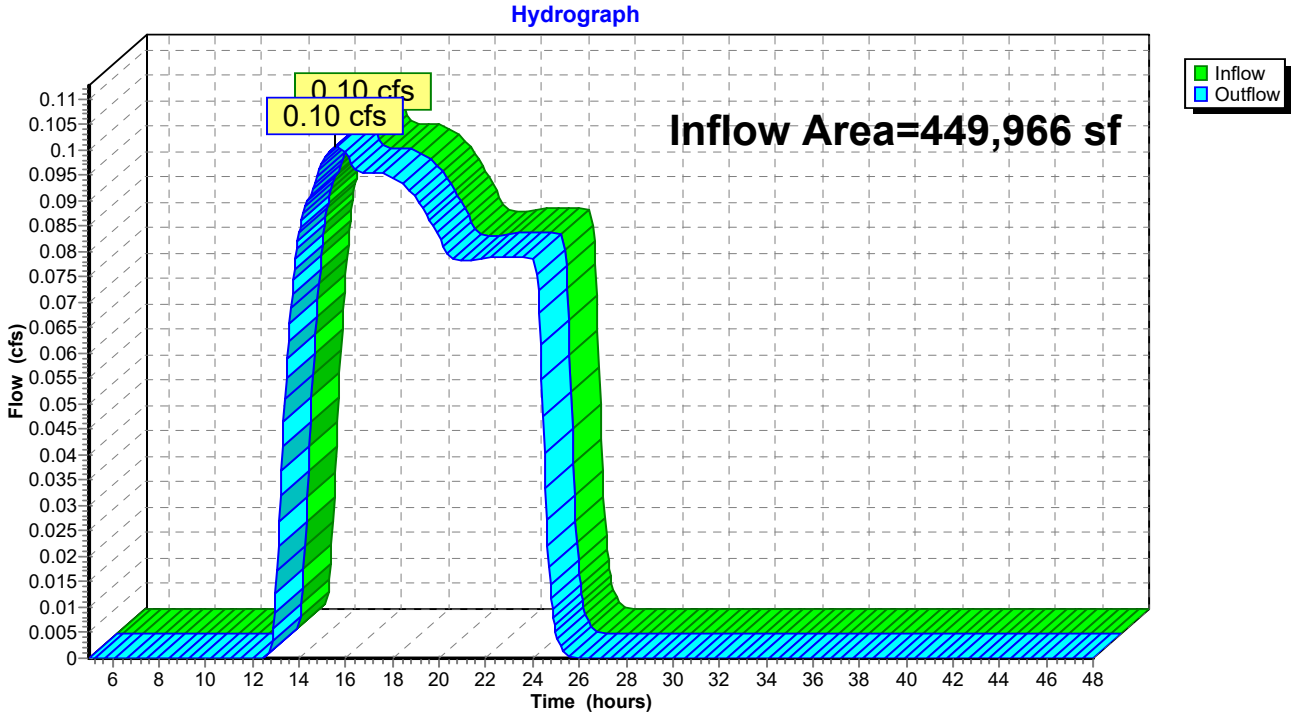
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.33	0.00	0.00	31.00	5.28	0.15	0.00
5.50	0.38	0.00	0.00	31.50	5.28	0.15	0.00
6.00	0.42	0.00	0.00	32.00	5.28	0.15	0.00
6.50	0.47	0.00	0.00	32.50	5.28	0.15	0.00
7.00	0.52	0.00	0.00	33.00	5.28	0.15	0.00
7.50	0.58	0.00	0.00	33.50	5.28	0.15	0.00
8.00	0.63	0.00	0.00	34.00	5.28	0.15	0.00
8.50	0.70	0.00	0.00	34.50	5.28	0.15	0.00
9.00	0.78	0.00	0.00	35.00	5.28	0.15	0.00
9.50	0.86	0.00	0.00	35.50	5.28	0.15	0.00
10.00	0.96	0.00	0.00	36.00	5.28	0.15	0.00
10.50	1.08	0.00	0.00	36.50	5.28	0.15	0.00
11.00	1.24	0.00	0.00	37.00	5.28	0.15	0.00
11.50	1.49	0.00	0.00	37.50	5.28	0.15	0.00
12.00	3.50	0.00	0.00	38.00	5.28	0.15	0.00
12.50	3.88	0.01	0.04	38.50	5.28	0.15	0.00
13.00	4.08	0.01	0.16	39.00	5.28	0.15	0.00
13.50	4.22	0.02	**0.19**	39.50	5.28	0.15	0.00
14.00	4.33	0.03	**0.18**	40.00	5.28	0.15	0.00
14.50	4.42	0.04	0.17	40.50	5.28	0.15	0.00
15.00	4.51	0.05	0.17	41.00	5.28	0.15	0.00
15.50	4.58	0.06	0.16	41.50	5.28	0.15	0.00
16.00	4.65	0.06	0.16	42.00	5.28	0.15	0.00
16.50	4.71	0.07	0.15	42.50	5.28	0.15	0.00
17.00	4.76	0.08	0.14	43.00	5.28	0.15	0.00
17.50	4.81	0.08	0.14	43.50	5.28	0.15	0.00
18.00	4.86	0.09	0.14	44.00	5.28	0.15	0.00
18.50	4.91	0.10	0.13	44.50	5.28	0.15	0.00
19.00	4.95	0.10	0.13	45.00	5.28	0.15	0.00
19.50	4.99	0.11	0.12	45.50	5.28	0.15	0.00
20.00	5.03	0.11	0.11	46.00	5.28	0.15	0.00
20.50	5.06	0.12	0.11	46.50	5.28	0.15	0.00
21.00	5.09	0.12	0.11	47.00	5.28	0.15	0.00
21.50	5.13	0.13	0.11	47.50	5.28	0.15	0.00
22.00	5.16	0.13	0.10	48.00	5.28	0.15	0.00
22.50	5.19	0.14	0.10				
23.00	5.22	0.14	0.10				
23.50	5.25	0.15	0.10				
24.00	**5.28**	**0.15**	0.10				
24.50	5.28	0.15	0.05				
25.00	5.28	0.15	0.01				
25.50	5.28	0.15	0.00				
26.00	5.28	0.15	0.00				
26.50	5.28	0.15	0.00				
27.00	5.28	0.15	0.00				
27.50	5.28	0.15	0.00				
28.00	5.28	0.15	0.00				
28.50	5.28	0.15	0.00				
29.00	5.28	0.15	0.00				
29.50	5.28	0.15	0.00				
30.00	5.28	0.15	0.00				
30.50	5.28	0.15	0.00				

Summary for Reach 5R: Pre

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.09" for 25-yr event
Inflow = 0.10 cfs @ 15.56 hrs, Volume= 3,520 cf
Outflow = 0.10 cfs @ 15.56 hrs, Volume= 3,520 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 5R: Pre



Hydrograph for Reach 5R: Pre

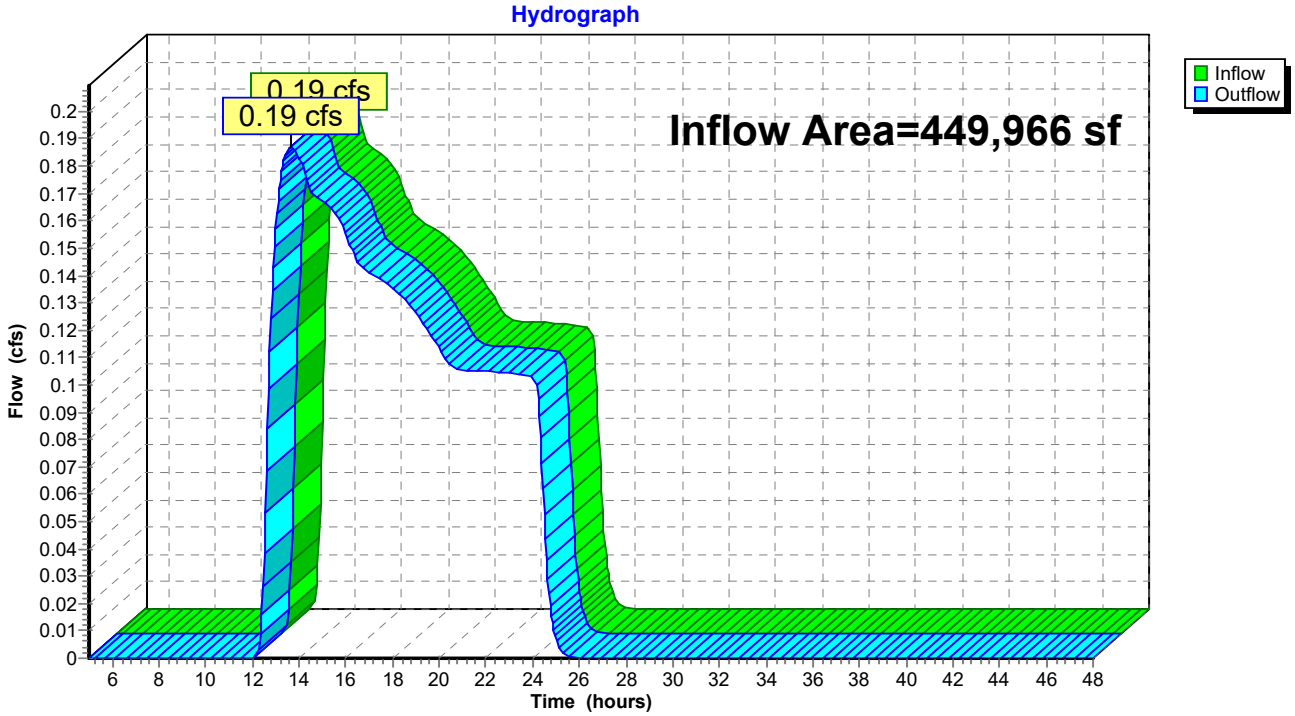
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.00		0.00	38.50	0.00		0.00
13.00	0.01		0.01	39.00	0.00		0.00
13.50	0.06		0.06	39.50	0.00		0.00
14.00	0.08		0.08	40.00	0.00		0.00
14.50	0.09		0.09	40.50	0.00		0.00
15.00	0.10		0.10	41.00	0.00		0.00
15.50	**0.10**		**0.10**	41.50	0.00		0.00
16.00	**0.10**		**0.10**	42.00	0.00		0.00
16.50	0.10		0.10	42.50	0.00		0.00
17.00	0.10		0.10	43.00	0.00		0.00
17.50	0.10		0.10	43.50	0.00		0.00
18.00	0.09		0.09	44.00	0.00		0.00
18.50	0.09		0.09	44.50	0.00		0.00
19.00	0.09		0.09	45.00	0.00		0.00
19.50	0.09		0.09	45.50	0.00		0.00
20.00	0.08		0.08	46.00	0.00		0.00
20.50	0.08		0.08	46.50	0.00		0.00
21.00	0.08		0.08	47.00	0.00		0.00
21.50	0.08		0.08	47.50	0.00		0.00
22.00	0.08		0.08	48.00	0.00		0.00
22.50	0.08		0.08				
23.00	0.08		0.08				
23.50	0.08		0.08				
24.00	0.08		0.08				
24.50	0.04		0.04				
25.00	0.01		0.01				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Summary for Reach 6R: Post

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.15" for 25-yr event
Inflow = 0.19 cfs @ 13.67 hrs, Volume= 5,718 cf
Outflow = 0.19 cfs @ 13.67 hrs, Volume= 5,718 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 6R: Post



Hydrograph for Reach 6R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.04		0.04	38.50	0.00		0.00
13.00	0.16		0.16	39.00	0.00		0.00
13.50	**0.19**		**0.19**	39.50	0.00		0.00
14.00	**0.18**		**0.18**	40.00	0.00		0.00
14.50	0.17		0.17	40.50	0.00		0.00
15.00	0.17		0.17	41.00	0.00		0.00
15.50	0.16		0.16	41.50	0.00		0.00
16.00	0.16		0.16	42.00	0.00		0.00
16.50	0.15		0.15	42.50	0.00		0.00
17.00	0.14		0.14	43.00	0.00		0.00
17.50	0.14		0.14	43.50	0.00		0.00
18.00	0.14		0.14	44.00	0.00		0.00
18.50	0.13		0.13	44.50	0.00		0.00
19.00	0.13		0.13	45.00	0.00		0.00
19.50	0.12		0.12	45.50	0.00		0.00
20.00	0.11		0.11	46.00	0.00		0.00
20.50	0.11		0.11	46.50	0.00		0.00
21.00	0.11		0.11	47.00	0.00		0.00
21.50	0.11		0.11	47.50	0.00		0.00
22.00	0.10		0.10	48.00	0.00		0.00
22.50	0.10		0.10				
23.00	0.10		0.10				
23.50	0.10		0.10				
24.00	0.10		0.10				
24.50	0.05		0.05				
25.00	0.01		0.01				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=882' Tc=35.8 min CN=34 Runoff=0.33 cfs 8,599 cf

Subcatchment 5S: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.32"
Flow Length=882' Tc=35.8 min CN=36 Runoff=0.65 cfs 12,034 cf

Reach 5R: Pre Inflow=0.33 cfs 8,599 cf
Outflow=0.33 cfs 8,599 cf

Reach 6R: Post Inflow=0.65 cfs 12,034 cf
Outflow=0.65 cfs 12,034 cf

Total Runoff Area = 899,932 sf Runoff Volume = 20,633 cf Average Runoff Depth = 0.28"
100.00% Pervious = 899,932 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1P:

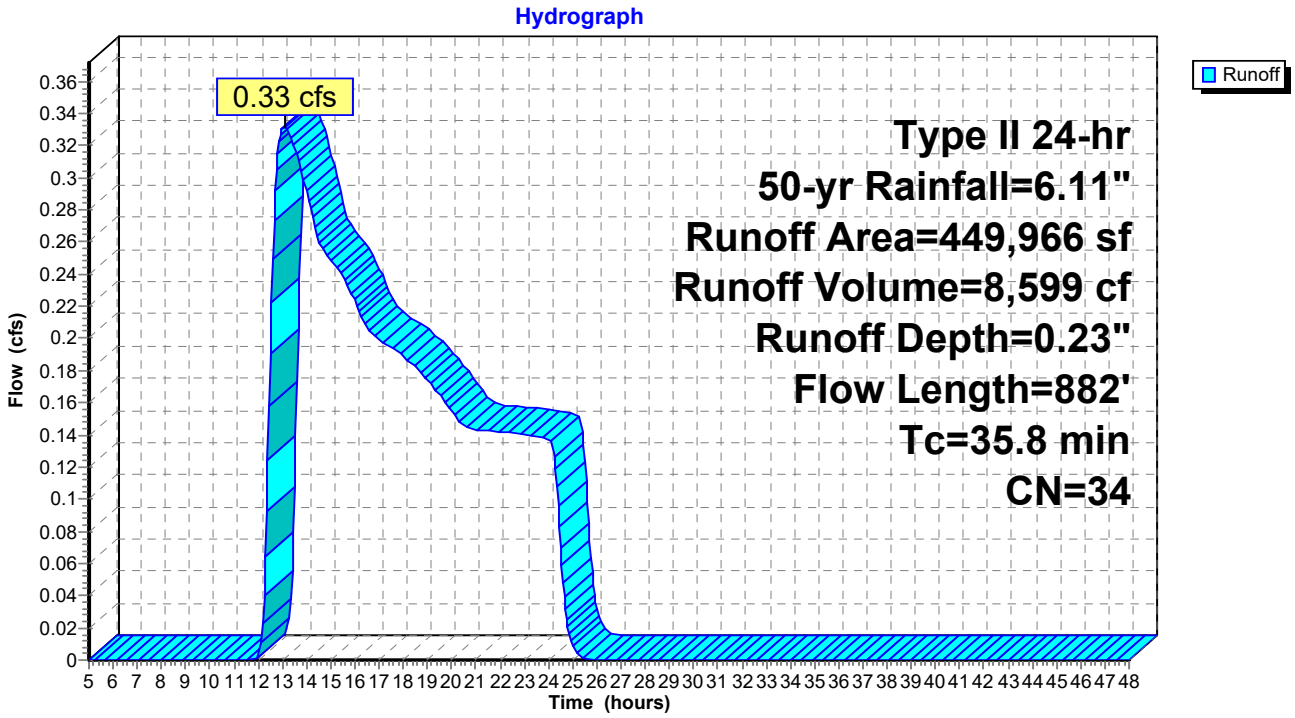
Runoff = 0.33 cfs @ 13.10 hrs, Volume= 8,599 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.11"

	Area (sf)	CN	Description
	258,380	36	Woods, Fair, HSG A
	189,629	30	Meadow, non-grazed, HSG A
*	1,957	89	Gravel
	449,966	34	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 1P:



Hydrograph for Subcatchment 1P:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.38	0.00	0.00	31.00	6.11	0.23	0.00
5.50	0.44	0.00	0.00	31.50	6.11	0.23	0.00
6.00	0.49	0.00	0.00	32.00	6.11	0.23	0.00
6.50	0.55	0.00	0.00	32.50	6.11	0.23	0.00
7.00	0.60	0.00	0.00	33.00	6.11	0.23	0.00
7.50	0.67	0.00	0.00	33.50	6.11	0.23	0.00
8.00	0.73	0.00	0.00	34.00	6.11	0.23	0.00
8.50	0.81	0.00	0.00	34.50	6.11	0.23	0.00
9.00	0.90	0.00	0.00	35.00	6.11	0.23	0.00
9.50	1.00	0.00	0.00	35.50	6.11	0.23	0.00
10.00	1.11	0.00	0.00	36.00	6.11	0.23	0.00
10.50	1.25	0.00	0.00	36.50	6.11	0.23	0.00
11.00	1.44	0.00	0.00	37.00	6.11	0.23	0.00
11.50	1.73	0.00	0.00	37.50	6.11	0.23	0.00
12.00	4.05	0.00	0.00	38.00	6.11	0.23	0.00
12.50	4.49	0.02	0.19	38.50	6.11	0.23	0.00
13.00	4.72	0.03	**0.33**	39.00	6.11	0.23	0.00
13.50	4.88	0.05	**0.32**	39.50	6.11	0.23	0.00
14.00	5.01	0.06	0.29	40.00	6.11	0.23	0.00
14.50	5.12	0.07	0.26	40.50	6.11	0.23	0.00
15.00	5.21	0.09	0.25	41.00	6.11	0.23	0.00
15.50	5.30	0.10	0.24	41.50	6.11	0.23	0.00
16.00	5.38	0.11	0.22	42.00	6.11	0.23	0.00
16.50	5.45	0.12	0.21	42.50	6.11	0.23	0.00
17.00	5.51	0.13	0.20	43.00	6.11	0.23	0.00
17.50	5.57	0.14	0.19	43.50	6.11	0.23	0.00
18.00	5.63	0.14	0.19	44.00	6.11	0.23	0.00
18.50	5.68	0.15	0.18	44.50	6.11	0.23	0.00
19.00	5.73	0.16	0.17	45.00	6.11	0.23	0.00
19.50	5.78	0.17	0.16	45.50	6.11	0.23	0.00
20.00	5.82	0.18	0.16	46.00	6.11	0.23	0.00
20.50	5.86	0.18	0.15	46.50	6.11	0.23	0.00
21.00	5.89	0.19	0.14	47.00	6.11	0.23	0.00
21.50	5.93	0.20	0.14	47.50	6.11	0.23	0.00
22.00	5.97	0.20	0.14	48.00	6.11	0.23	0.00
22.50	6.01	0.21	0.14				
23.00	6.04	0.22	0.14				
23.50	6.08	0.22	0.14				
24.00	**6.11**	**0.23**	0.14				
24.50	6.11	0.23	0.07				
25.00	6.11	0.23	0.01				
25.50	6.11	0.23	0.00				
26.00	6.11	0.23	0.00				
26.50	6.11	0.23	0.00				
27.00	6.11	0.23	0.00				
27.50	6.11	0.23	0.00				
28.00	6.11	0.23	0.00				
28.50	6.11	0.23	0.00				
29.00	6.11	0.23	0.00				
29.50	6.11	0.23	0.00				
30.00	6.11	0.23	0.00				
30.50	6.11	0.23	0.00				

Summary for Subcatchment 5S:

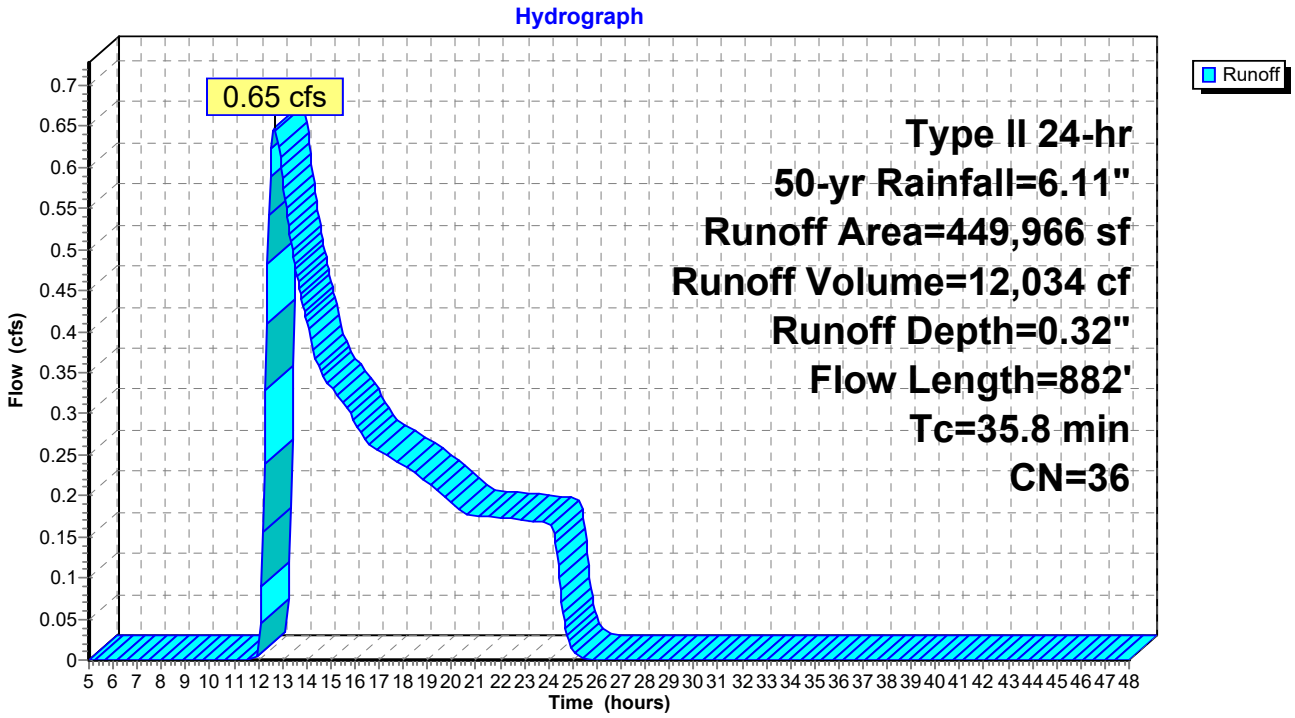
Runoff = 0.65 cfs @ 12.67 hrs, Volume= 12,034 cf, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.11"

	Area (sf)	CN	Description
	251,361	36	Woods, Fair, HSG A
	181,079	30	Meadow, non-grazed, HSG A
*	17,526	89	Gravel
	449,966	36	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 5S:



Hydrograph for Subcatchment 5S:

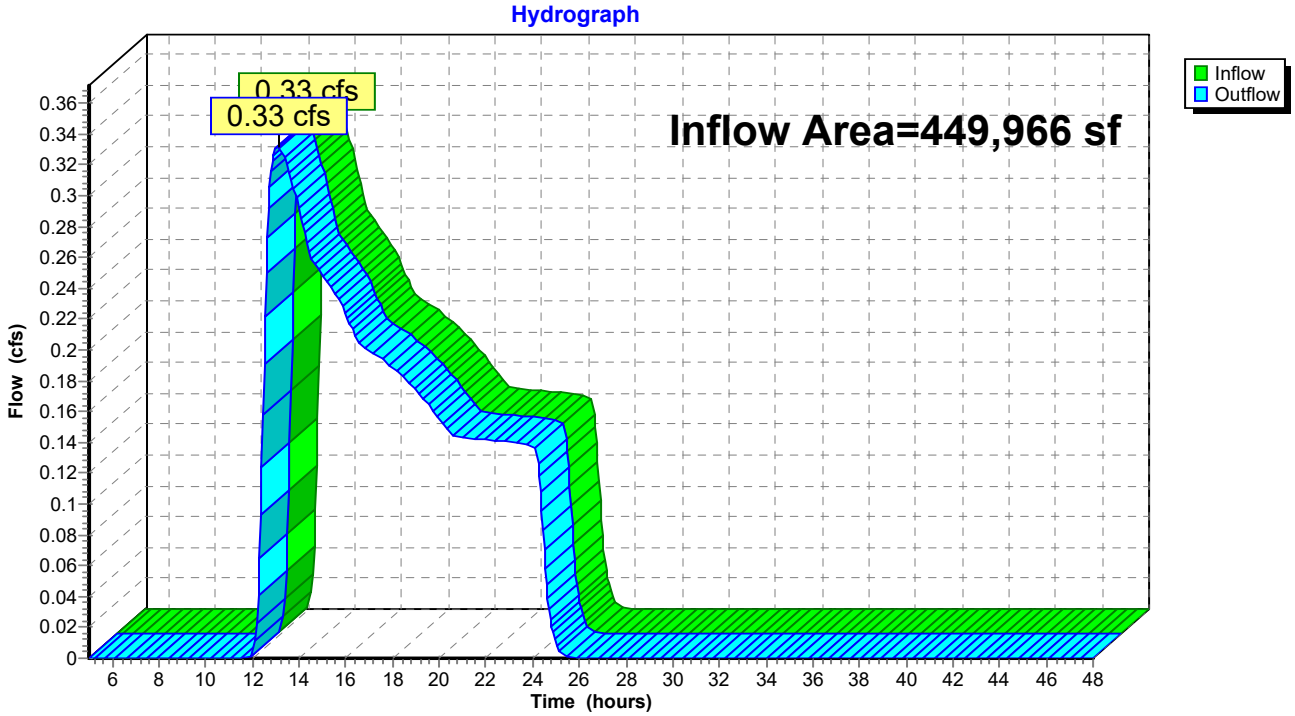
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.38	0.00	0.00	31.00	6.11	0.32	0.00
5.50	0.44	0.00	0.00	31.50	6.11	0.32	0.00
6.00	0.49	0.00	0.00	32.00	6.11	0.32	0.00
6.50	0.55	0.00	0.00	32.50	6.11	0.32	0.00
7.00	0.60	0.00	0.00	33.00	6.11	0.32	0.00
7.50	0.67	0.00	0.00	33.50	6.11	0.32	0.00
8.00	0.73	0.00	0.00	34.00	6.11	0.32	0.00
8.50	0.81	0.00	0.00	34.50	6.11	0.32	0.00
9.00	0.90	0.00	0.00	35.00	6.11	0.32	0.00
9.50	1.00	0.00	0.00	35.50	6.11	0.32	0.00
10.00	1.11	0.00	0.00	36.00	6.11	0.32	0.00
10.50	1.25	0.00	0.00	36.50	6.11	0.32	0.00
11.00	1.44	0.00	0.00	37.00	6.11	0.32	0.00
11.50	1.73	0.00	0.00	37.50	6.11	0.32	0.00
12.00	4.05	0.01	0.00	38.00	6.11	0.32	0.00
12.50	4.49	0.05	**0.59**	38.50	6.11	0.32	0.00
13.00	4.72	0.07	**0.59**	39.00	6.11	0.32	0.00
13.50	4.88	0.09	0.48	39.50	6.11	0.32	0.00
14.00	5.01	0.11	0.41	40.00	6.11	0.32	0.00
14.50	5.12	0.13	0.36	40.50	6.11	0.32	0.00
15.00	5.21	0.14	0.33	41.00	6.11	0.32	0.00
15.50	5.30	0.16	0.31	41.50	6.11	0.32	0.00
16.00	5.38	0.17	0.29	42.00	6.11	0.32	0.00
16.50	5.45	0.18	0.27	42.50	6.11	0.32	0.00
17.00	5.51	0.19	0.25	43.00	6.11	0.32	0.00
17.50	5.57	0.21	0.25	43.50	6.11	0.32	0.00
18.00	5.63	0.22	0.24	44.00	6.11	0.32	0.00
18.50	5.68	0.23	0.23	44.50	6.11	0.32	0.00
19.00	5.73	0.24	0.22	45.00	6.11	0.32	0.00
19.50	5.78	0.25	0.20	45.50	6.11	0.32	0.00
20.00	5.82	0.26	0.19	46.00	6.11	0.32	0.00
20.50	5.86	0.26	0.18	46.50	6.11	0.32	0.00
21.00	5.89	0.27	0.18	47.00	6.11	0.32	0.00
21.50	5.93	0.28	0.17	47.50	6.11	0.32	0.00
22.00	5.97	0.29	0.17	48.00	6.11	0.32	0.00
22.50	6.01	0.30	0.17				
23.00	6.04	0.30	0.17				
23.50	6.08	0.31	0.17				
24.00	**6.11**	**0.32**	0.17				
24.50	6.11	0.32	0.08				
25.00	6.11	0.32	0.01				
25.50	6.11	0.32	0.00				
26.00	6.11	0.32	0.00				
26.50	6.11	0.32	0.00				
27.00	6.11	0.32	0.00				
27.50	6.11	0.32	0.00				
28.00	6.11	0.32	0.00				
28.50	6.11	0.32	0.00				
29.00	6.11	0.32	0.00				
29.50	6.11	0.32	0.00				
30.00	6.11	0.32	0.00				
30.50	6.11	0.32	0.00				

Summary for Reach 5R: Pre

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.23" for 50-yr event
Inflow = 0.33 cfs @ 13.10 hrs, Volume= 8,599 cf
Outflow = 0.33 cfs @ 13.10 hrs, Volume= 8,599 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 5R: Pre



Hydrograph for Reach 5R: Pre

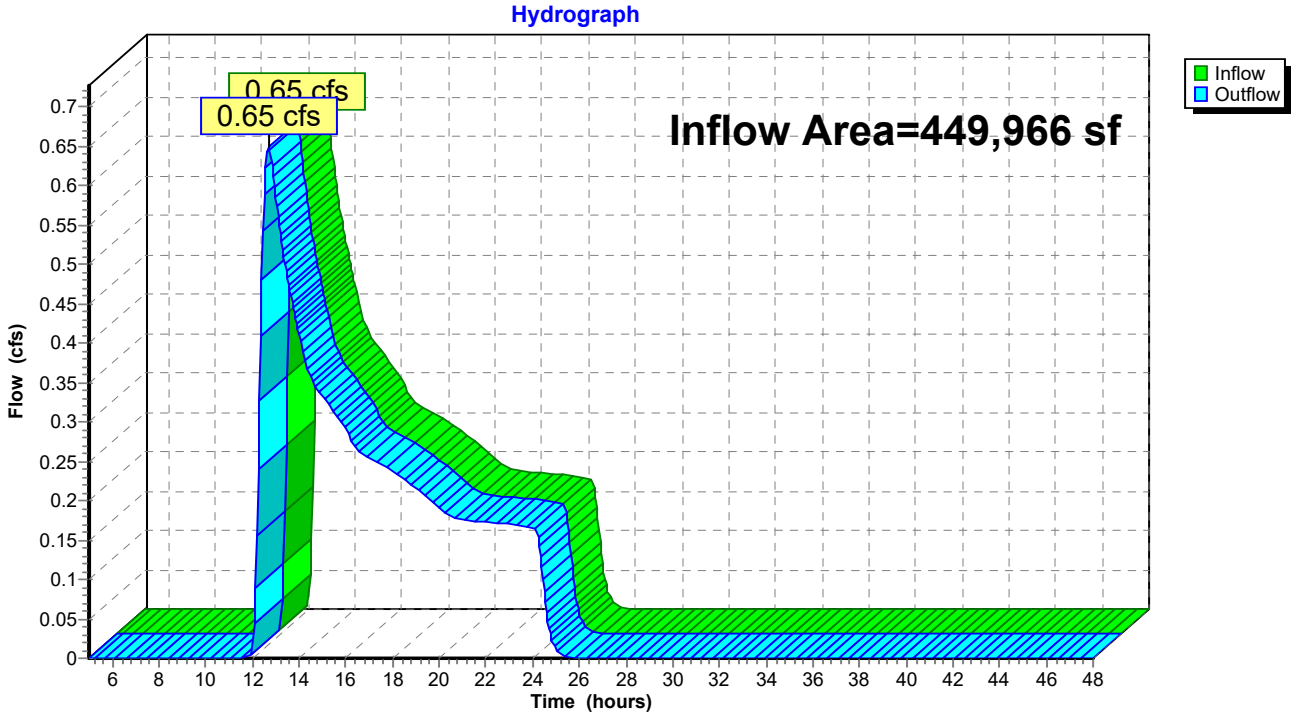
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	0.19		0.19	38.50	0.00		0.00
13.00	**0.33**		**0.33**	39.00	0.00		0.00
13.50	**0.32**		**0.32**	39.50	0.00		0.00
14.00	0.29		0.29	40.00	0.00		0.00
14.50	0.26		0.26	40.50	0.00		0.00
15.00	0.25		0.25	41.00	0.00		0.00
15.50	0.24		0.24	41.50	0.00		0.00
16.00	0.22		0.22	42.00	0.00		0.00
16.50	0.21		0.21	42.50	0.00		0.00
17.00	0.20		0.20	43.00	0.00		0.00
17.50	0.19		0.19	43.50	0.00		0.00
18.00	0.19		0.19	44.00	0.00		0.00
18.50	0.18		0.18	44.50	0.00		0.00
19.00	0.17		0.17	45.00	0.00		0.00
19.50	0.16		0.16	45.50	0.00		0.00
20.00	0.16		0.16	46.00	0.00		0.00
20.50	0.15		0.15	46.50	0.00		0.00
21.00	0.14		0.14	47.00	0.00		0.00
21.50	0.14		0.14	47.50	0.00		0.00
22.00	0.14		0.14	48.00	0.00		0.00
22.50	0.14		0.14				
23.00	0.14		0.14				
23.50	0.14		0.14				
24.00	0.14		0.14				
24.50	0.07		0.07				
25.00	0.01		0.01				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Summary for Reach 6R: Post

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.32" for 50-yr event
Inflow = 0.65 cfs @ 12.67 hrs, Volume= 12,034 cf
Outflow = 0.65 cfs @ 12.67 hrs, Volume= 12,034 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 6R: Post



Hydrograph for Reach 6R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.00		0.00	38.00	0.00		0.00
12.50	**0.59**		**0.59**	38.50	0.00		0.00
13.00	**0.59**		**0.59**	39.00	0.00		0.00
13.50	0.48		0.48	39.50	0.00		0.00
14.00	0.41		0.41	40.00	0.00		0.00
14.50	0.36		0.36	40.50	0.00		0.00
15.00	0.33		0.33	41.00	0.00		0.00
15.50	0.31		0.31	41.50	0.00		0.00
16.00	0.29		0.29	42.00	0.00		0.00
16.50	0.27		0.27	42.50	0.00		0.00
17.00	0.25		0.25	43.00	0.00		0.00
17.50	0.25		0.25	43.50	0.00		0.00
18.00	0.24		0.24	44.00	0.00		0.00
18.50	0.23		0.23	44.50	0.00		0.00
19.00	0.22		0.22	45.00	0.00		0.00
19.50	0.20		0.20	45.50	0.00		0.00
20.00	0.19		0.19	46.00	0.00		0.00
20.50	0.18		0.18	46.50	0.00		0.00
21.00	0.18		0.18	47.00	0.00		0.00
21.50	0.17		0.17	47.50	0.00		0.00
22.00	0.17		0.17	48.00	0.00		0.00
22.50	0.17		0.17				
23.00	0.17		0.17				
23.50	0.17		0.17				
24.00	0.17		0.17				
24.50	0.08		0.08				
25.00	0.01		0.01				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.45"
Flow Length=882' Tc=35.8 min CN=34 Runoff=1.14 cfs 16,958 cf

Subcatchment 5S: Runoff Area=449,966 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=882' Tc=35.8 min CN=36 Runoff=1.92 cfs 21,865 cf

Reach 5R: Pre Inflow=1.14 cfs 16,958 cf
Outflow=1.14 cfs 16,958 cf

Reach 6R: Post Inflow=1.92 cfs 21,865 cf
Outflow=1.92 cfs 21,865 cf

Total Runoff Area = 899,932 sf Runoff Volume = 38,823 cf Average Runoff Depth = 0.52"
100.00% Pervious = 899,932 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1P:

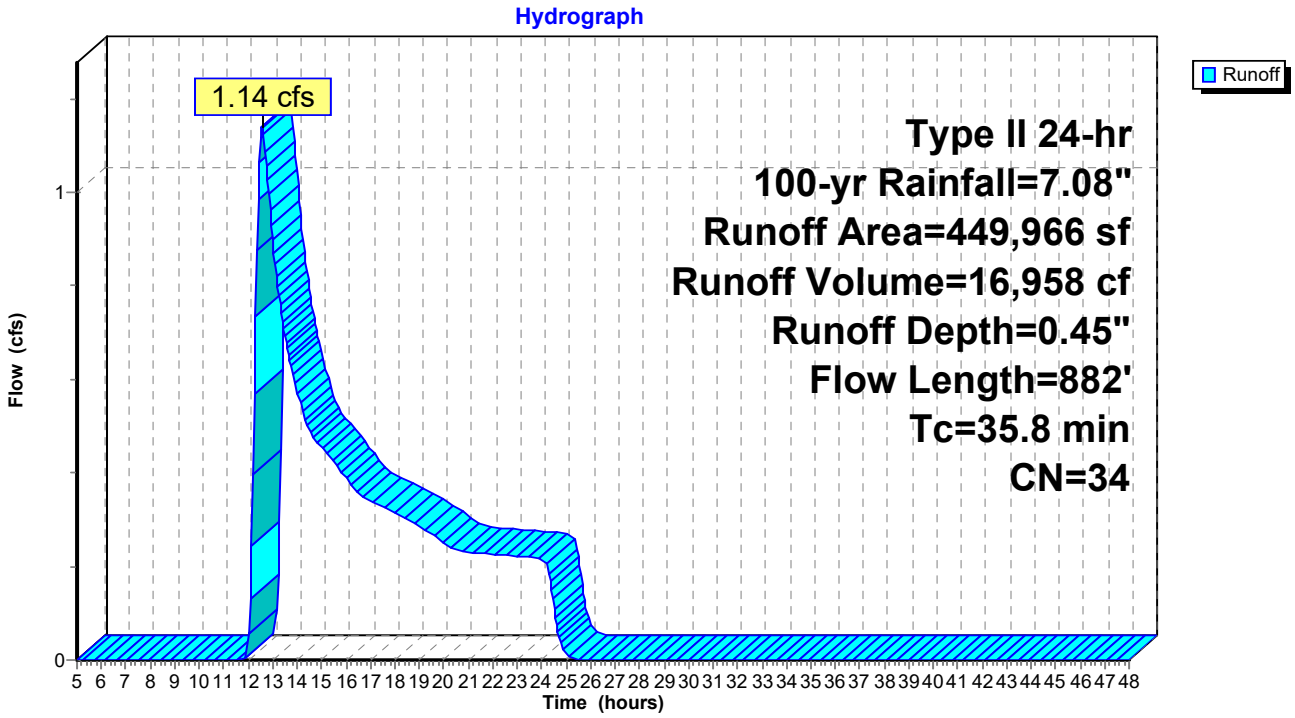
Runoff = 1.14 cfs @ 12.57 hrs, Volume= 16,958 cf, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.08"

	Area (sf)	CN	Description
	258,380	36	Woods, Fair, HSG A
	189,629	30	Meadow, non-grazed, HSG A
*	1,957	89	Gravel
	449,966	34	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 1P:



Hydrograph for Subcatchment 1P:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.45	0.00	0.00	31.00	7.08	0.45	0.00
5.50	0.50	0.00	0.00	31.50	7.08	0.45	0.00
6.00	0.57	0.00	0.00	32.00	7.08	0.45	0.00
6.50	0.63	0.00	0.00	32.50	7.08	0.45	0.00
7.00	0.70	0.00	0.00	33.00	7.08	0.45	0.00
7.50	0.77	0.00	0.00	33.50	7.08	0.45	0.00
8.00	0.85	0.00	0.00	34.00	7.08	0.45	0.00
8.50	0.94	0.00	0.00	34.50	7.08	0.45	0.00
9.00	1.04	0.00	0.00	35.00	7.08	0.45	0.00
9.50	1.15	0.00	0.00	35.50	7.08	0.45	0.00
10.00	1.28	0.00	0.00	36.00	7.08	0.45	0.00
10.50	1.44	0.00	0.00	36.50	7.08	0.45	0.00
11.00	1.66	0.00	0.00	37.00	7.08	0.45	0.00
11.50	2.00	0.00	0.00	37.50	7.08	0.45	0.00
12.00	4.69	0.03	0.02	38.00	7.08	0.45	0.00
12.50	5.20	0.08	**1.11**	38.50	7.08	0.45	0.00
13.00	5.47	0.12	**0.90**	39.00	7.08	0.45	0.00
13.50	5.66	0.15	0.69	39.50	7.08	0.45	0.00
14.00	5.81	0.17	0.57	40.00	7.08	0.45	0.00
14.50	5.93	0.20	0.49	40.50	7.08	0.45	0.00
15.00	6.04	0.22	0.45	41.00	7.08	0.45	0.00
15.50	6.14	0.24	0.42	41.50	7.08	0.45	0.00
16.00	6.23	0.25	0.39	42.00	7.08	0.45	0.00
16.50	6.31	0.27	0.36	42.50	7.08	0.45	0.00
17.00	6.38	0.29	0.34	43.00	7.08	0.45	0.00
17.50	6.45	0.30	0.33	43.50	7.08	0.45	0.00
18.00	6.52	0.32	0.31	44.00	7.08	0.45	0.00
18.50	6.58	0.33	0.30	44.50	7.08	0.45	0.00
19.00	6.64	0.34	0.28	45.00	7.08	0.45	0.00
19.50	6.69	0.36	0.27	45.50	7.08	0.45	0.00
20.00	6.74	0.37	0.25	46.00	7.08	0.45	0.00
20.50	6.79	0.38	0.23	46.50	7.08	0.45	0.00
21.00	6.83	0.39	0.23	47.00	7.08	0.45	0.00
21.50	6.87	0.40	0.23	47.50	7.08	0.45	0.00
22.00	6.92	0.41	0.23	48.00	7.08	0.45	0.00
22.50	6.96	0.42	0.22				
23.00	7.00	0.43	0.22				
23.50	7.04	0.44	0.22				
24.00	**7.08**	**0.45**	0.22				
24.50	7.08	0.45	0.11				
25.00	7.08	0.45	0.01				
25.50	7.08	0.45	0.00				
26.00	7.08	0.45	0.00				
26.50	7.08	0.45	0.00				
27.00	7.08	0.45	0.00				
27.50	7.08	0.45	0.00				
28.00	7.08	0.45	0.00				
28.50	7.08	0.45	0.00				
29.00	7.08	0.45	0.00				
29.50	7.08	0.45	0.00				
30.00	7.08	0.45	0.00				
30.50	7.08	0.45	0.00				

Summary for Subcatchment 5S:

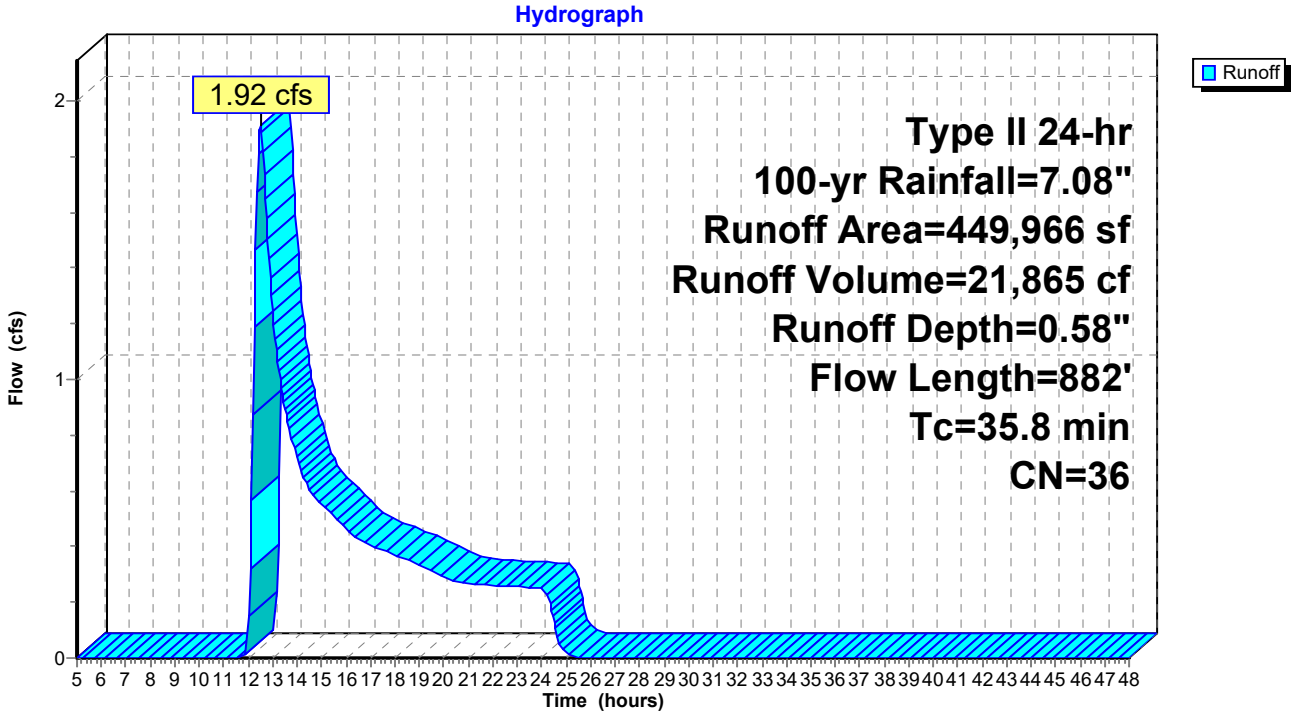
Runoff = 1.92 cfs @ 12.50 hrs, Volume= 21,865 cf, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.08"

	Area (sf)	CN	Description
	251,361	36	Woods, Fair, HSG A
	181,079	30	Meadow, non-grazed, HSG A
*	17,526	89	Gravel
	449,966	36	Weighted Average
	449,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
4.6	416	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	102	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	59	0.0700	5.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	205	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.8	882	Total			

Subcatchment 5S:



Hydrograph for Subcatchment 5S:

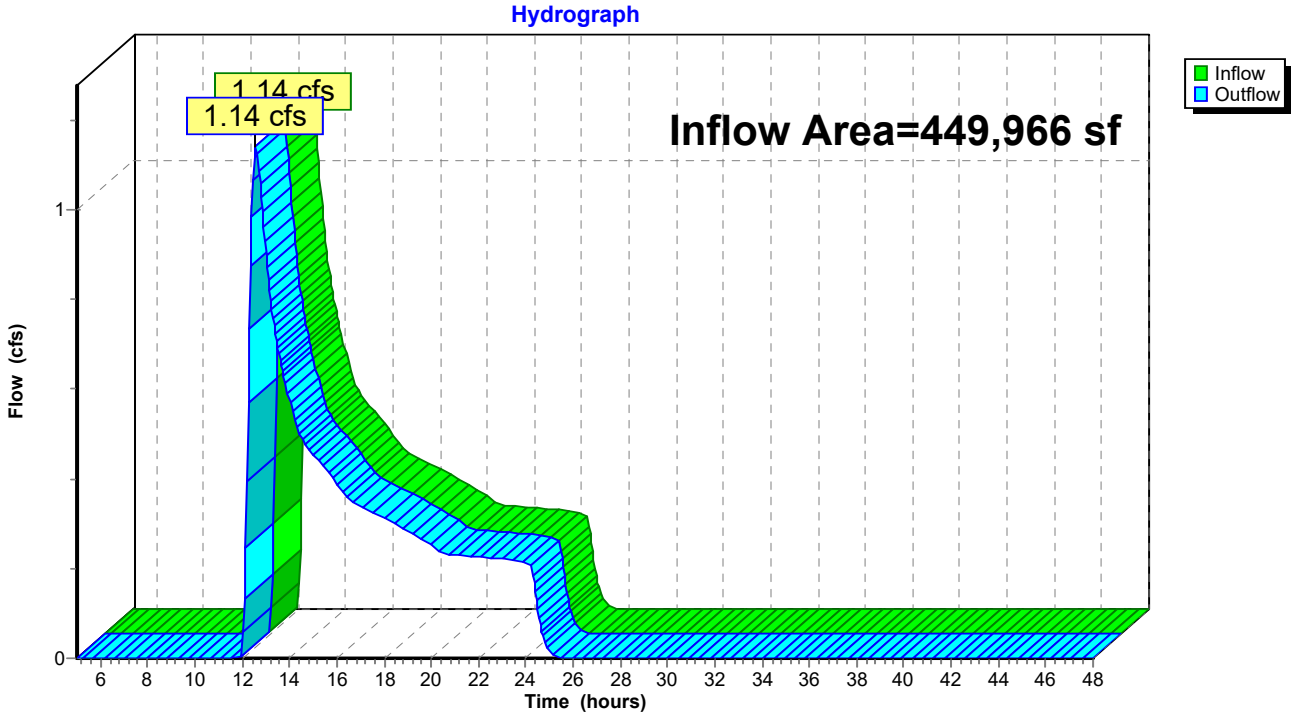
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.45	0.00	0.00	31.00	7.08	0.58	0.00
5.50	0.50	0.00	0.00	31.50	7.08	0.58	0.00
6.00	0.57	0.00	0.00	32.00	7.08	0.58	0.00
6.50	0.63	0.00	0.00	32.50	7.08	0.58	0.00
7.00	0.70	0.00	0.00	33.00	7.08	0.58	0.00
7.50	0.77	0.00	0.00	33.50	7.08	0.58	0.00
8.00	0.85	0.00	0.00	34.00	7.08	0.58	0.00
8.50	0.94	0.00	0.00	34.50	7.08	0.58	0.00
9.00	1.04	0.00	0.00	35.00	7.08	0.58	0.00
9.50	1.15	0.00	0.00	35.50	7.08	0.58	0.00
10.00	1.28	0.00	0.00	36.00	7.08	0.58	0.00
10.50	1.44	0.00	0.00	36.50	7.08	0.58	0.00
11.00	1.66	0.00	0.00	37.00	7.08	0.58	0.00
11.50	2.00	0.00	0.00	37.50	7.08	0.58	0.00
12.00	4.69	0.07	0.05	38.00	7.08	0.58	0.00
12.50	5.20	0.14	**1.92**	38.50	7.08	0.58	0.00
13.00	5.47	0.19	1.25	39.00	7.08	0.58	0.00
13.50	5.66	0.22	0.90	39.50	7.08	0.58	0.00
14.00	5.81	0.25	0.72	40.00	7.08	0.58	0.00
14.50	5.93	0.28	0.61	40.50	7.08	0.58	0.00
15.00	6.04	0.31	0.55	41.00	7.08	0.58	0.00
15.50	6.14	0.33	0.51	41.50	7.08	0.58	0.00
16.00	6.23	0.35	0.47	42.00	7.08	0.58	0.00
16.50	6.31	0.37	0.43	42.50	7.08	0.58	0.00
17.00	6.38	0.39	0.40	43.00	7.08	0.58	0.00
17.50	6.45	0.41	0.39	43.50	7.08	0.58	0.00
18.00	6.52	0.42	0.37	44.00	7.08	0.58	0.00
18.50	6.58	0.44	0.35	44.50	7.08	0.58	0.00
19.00	6.64	0.46	0.34	45.00	7.08	0.58	0.00
19.50	6.69	0.47	0.31	45.50	7.08	0.58	0.00
20.00	6.74	0.48	0.29	46.00	7.08	0.58	0.00
20.50	6.79	0.50	0.27	46.50	7.08	0.58	0.00
21.00	6.83	0.51	0.27	47.00	7.08	0.58	0.00
21.50	6.87	0.52	0.26	47.50	7.08	0.58	0.00
22.00	6.92	0.53	0.26	48.00	7.08	0.58	0.00
22.50	6.96	0.55	0.26				
23.00	7.00	0.56	0.26				
23.50	7.04	0.57	0.25				
24.00	**7.08**	**0.58**	0.25				
24.50	7.08	0.58	0.13				
25.00	7.08	0.58	0.02				
25.50	7.08	0.58	0.00				
26.00	7.08	0.58	0.00				
26.50	7.08	0.58	0.00				
27.00	7.08	0.58	0.00				
27.50	7.08	0.58	0.00				
28.00	7.08	0.58	0.00				
28.50	7.08	0.58	0.00				
29.00	7.08	0.58	0.00				
29.50	7.08	0.58	0.00				
30.00	7.08	0.58	0.00				
30.50	7.08	0.58	0.00				

Summary for Reach 5R: Pre

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.45" for 100-yr event
Inflow = 1.14 cfs @ 12.57 hrs, Volume= 16,958 cf
Outflow = 1.14 cfs @ 12.57 hrs, Volume= 16,958 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 5R: Pre



Hydrograph for Reach 5R: Pre

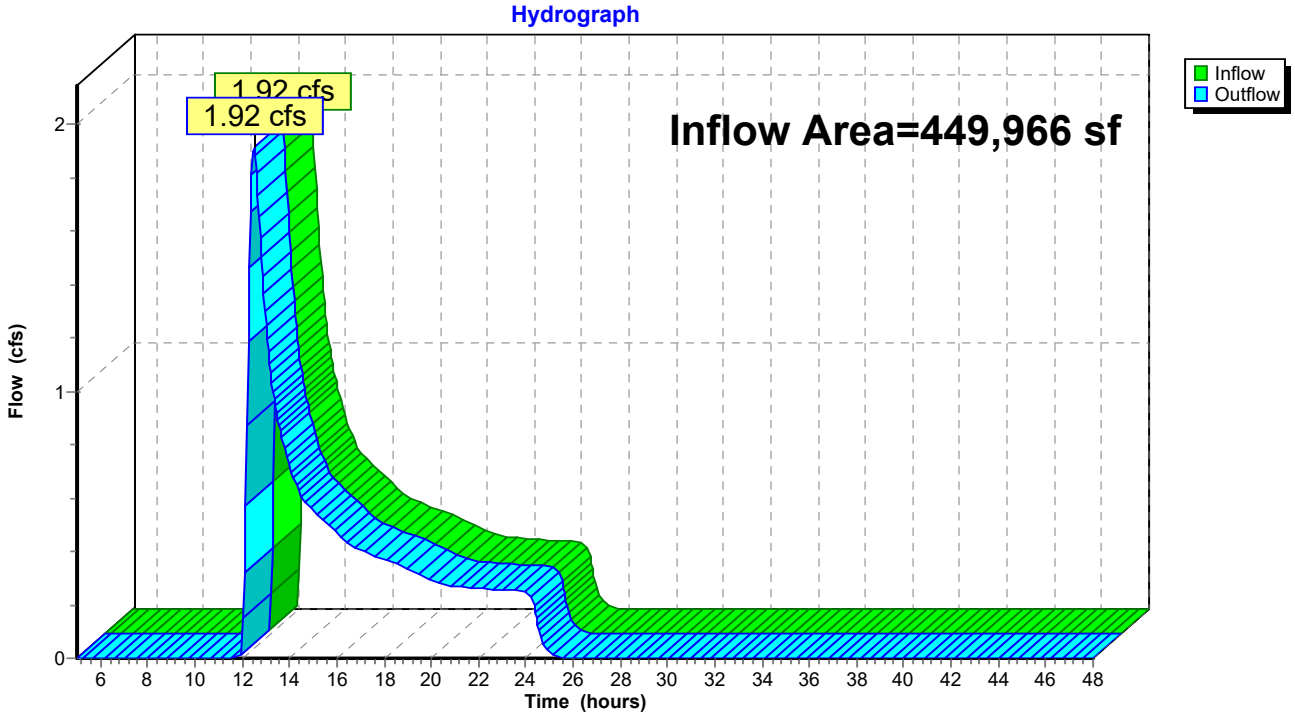
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.02		0.02	38.00	0.00		0.00
12.50	**1.11**		**1.11**	38.50	0.00		0.00
13.00	**0.90**		**0.90**	39.00	0.00		0.00
13.50	0.69		0.69	39.50	0.00		0.00
14.00	0.57		0.57	40.00	0.00		0.00
14.50	0.49		0.49	40.50	0.00		0.00
15.00	0.45		0.45	41.00	0.00		0.00
15.50	0.42		0.42	41.50	0.00		0.00
16.00	0.39		0.39	42.00	0.00		0.00
16.50	0.36		0.36	42.50	0.00		0.00
17.00	0.34		0.34	43.00	0.00		0.00
17.50	0.33		0.33	43.50	0.00		0.00
18.00	0.31		0.31	44.00	0.00		0.00
18.50	0.30		0.30	44.50	0.00		0.00
19.00	0.28		0.28	45.00	0.00		0.00
19.50	0.27		0.27	45.50	0.00		0.00
20.00	0.25		0.25	46.00	0.00		0.00
20.50	0.23		0.23	46.50	0.00		0.00
21.00	0.23		0.23	47.00	0.00		0.00
21.50	0.23		0.23	47.50	0.00		0.00
22.00	0.23		0.23	48.00	0.00		0.00
22.50	0.22		0.22				
23.00	0.22		0.22				
23.50	0.22		0.22				
24.00	0.22		0.22				
24.50	0.11		0.11				
25.00	0.01		0.01				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				

Summary for Reach 6R: Post

Inflow Area = 449,966 sf, 0.00% Impervious, Inflow Depth = 0.58" for 100-yr event
Inflow = 1.92 cfs @ 12.50 hrs, Volume= 21,865 cf
Outflow = 1.92 cfs @ 12.50 hrs, Volume= 21,865 cf, Atten= 0%, Lag= 0.0 min

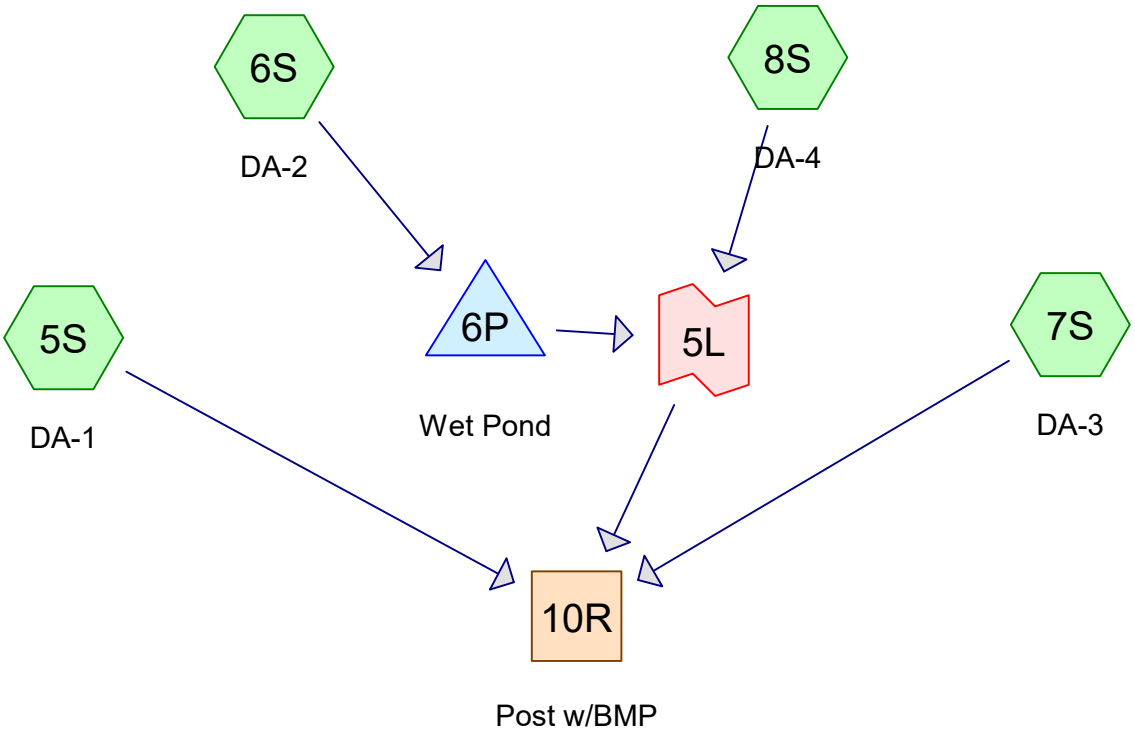
Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

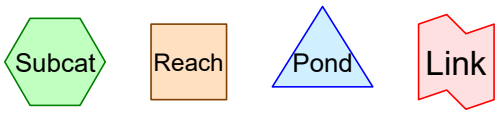
Reach 6R: Post



Hydrograph for Reach 6R: Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.00		0.00	37.50	0.00		0.00
12.00	0.05		0.05	38.00	0.00		0.00
12.50	**1.92**		**1.92**	38.50	0.00		0.00
13.00	1.25		1.25	39.00	0.00		0.00
13.50	0.90		0.90	39.50	0.00		0.00
14.00	0.72		0.72	40.00	0.00		0.00
14.50	0.61		0.61	40.50	0.00		0.00
15.00	0.55		0.55	41.00	0.00		0.00
15.50	0.51		0.51	41.50	0.00		0.00
16.00	0.47		0.47	42.00	0.00		0.00
16.50	0.43		0.43	42.50	0.00		0.00
17.00	0.40		0.40	43.00	0.00		0.00
17.50	0.39		0.39	43.50	0.00		0.00
18.00	0.37		0.37	44.00	0.00		0.00
18.50	0.35		0.35	44.50	0.00		0.00
19.00	0.34		0.34	45.00	0.00		0.00
19.50	0.31		0.31	45.50	0.00		0.00
20.00	0.29		0.29	46.00	0.00		0.00
20.50	0.27		0.27	46.50	0.00		0.00
21.00	0.27		0.27	47.00	0.00		0.00
21.50	0.26		0.26	47.50	0.00		0.00
22.00	0.26		0.26	48.00	0.00		0.00
22.50	0.26		0.26				
23.00	0.26		0.26				
23.50	0.25		0.25				
24.00	0.25		0.25				
24.50	0.13		0.13				
25.00	0.02		0.02				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				
30.50	0.00		0.00				





Routing Diagram for Benton Valve Yard_new_FPV_postwbmp_R1
Prepared by {enter your company name here}, Printed 5/19/2020
HydroCAD® 10.00-25 s/n 09710 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
17,511	89	Gravel area (6S)
166,443	30	Meadow, non-grazed, HSG A (5S, 6S, 7S, 8S)
313,893	36	Woods, Fair, HSG A (5S, 6S, 7S, 8S)
497,847	**36**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
480,336	HSG A	5S, 6S, 7S, 8S
0	HSG B	
0	HSG C	
0	HSG D	
17,511	Other	6S
497,847		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcat Numbe
0	0	0	0	17,511	17,511	Gravel area	
166,443	0	0	0	0	166,443	Meadow, non-grazed	
313,893	0	0	0	0	313,893	Woods, Fair	
480,336	**0**	**0**	**0**	**17,511**	**497,847**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	6P	1,245.00	1,243.00	100.0	0.0200	0.012	15.0	0.0	0.0

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.442 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=561' Tc=19.7 min CN=33 Runoff=0.00 cfs 0 cf

Subcatchment 6S: DA-2 Runoff Area=5.118 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=868' Tc=29.6 min CN=38 Runoff=0.00 cfs 0 cf

Subcatchment 7S: DA-3 Runoff Area=4.547 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=822' Tc=41.1 min CN=34 Runoff=0.00 cfs 0 cf

Subcatchment 8S: DA-4 Runoff Area=0.322 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=77' Slope=0.2000 '/' Tc=8.8 min CN=33 Runoff=0.00 cfs 0 cf

Reach 10R: Post w/BMP Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond 6P: Wet Pond Peak Elev=1,242.50' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Link 5L: Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 497,847 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"
100.00% Pervious = 497,847 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

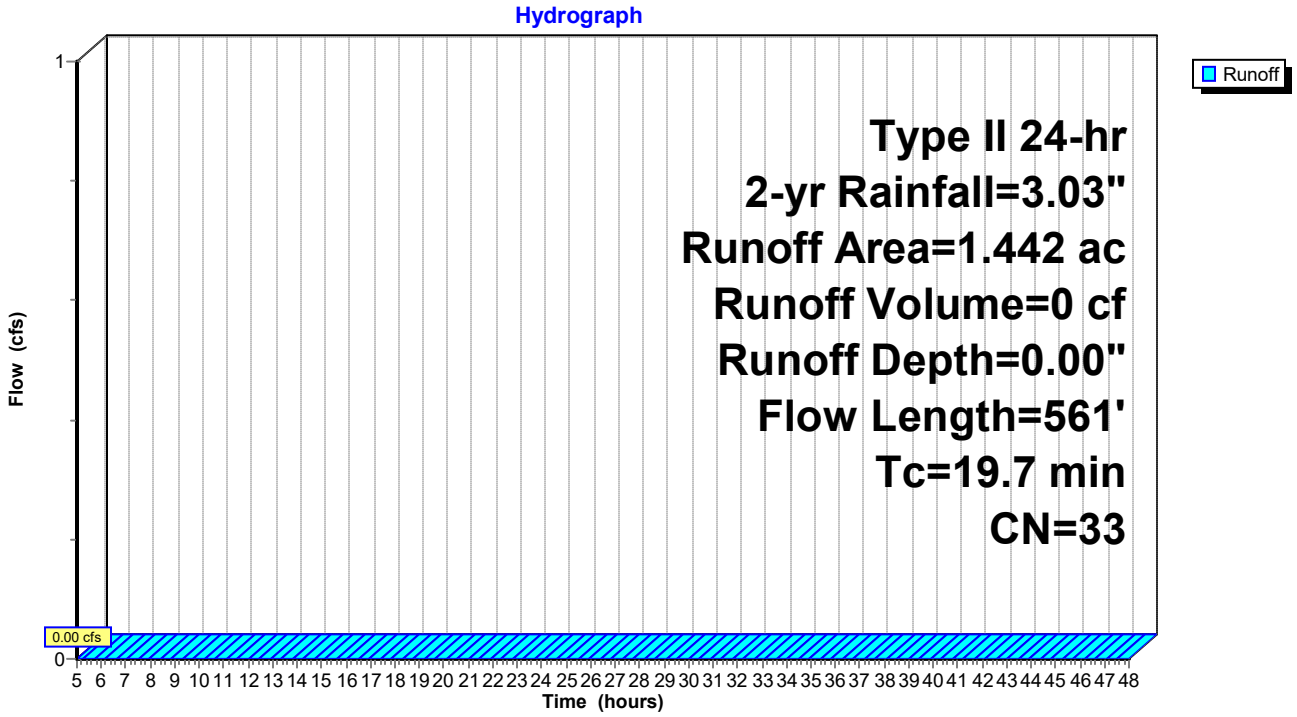
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.03"

Area (ac)	CN	Description
0.707	36	Woods, Fair, HSG A
0.735	30	Meadow, non-grazed, HSG A
1.442	33	Weighted Average
1.442		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	76	0.1050	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.8	485	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	561	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.19	**0.00**	**0.00**	30.50	3.03	0.00	0.00
5.50	0.22	0.00	0.00	31.00	3.03	0.00	0.00
6.00	0.24	0.00	0.00	31.50	3.03	0.00	0.00
6.50	0.27	0.00	0.00	32.00	3.03	0.00	0.00
7.00	0.30	0.00	0.00	32.50	3.03	0.00	0.00
7.50	0.33	0.00	0.00	33.00	3.03	0.00	0.00
8.00	0.36	0.00	0.00	33.50	3.03	0.00	0.00
8.50	0.40	0.00	0.00	34.00	3.03	0.00	0.00
9.00	0.45	0.00	0.00	34.50	3.03	0.00	0.00
9.50	0.49	0.00	0.00	35.00	3.03	0.00	0.00
10.00	0.55	0.00	0.00	35.50	3.03	0.00	0.00
10.50	0.62	0.00	0.00	36.00	3.03	0.00	0.00
11.00	0.71	0.00	0.00	36.50	3.03	0.00	0.00
11.50	0.86	0.00	0.00	37.00	3.03	0.00	0.00
12.00	2.01	0.00	0.00	37.50	3.03	0.00	0.00
12.50	2.23	0.00	0.00	38.00	3.03	0.00	0.00
13.00	2.34	0.00	0.00	38.50	3.03	0.00	0.00
13.50	2.42	0.00	0.00	39.00	3.03	0.00	0.00
14.00	2.48	0.00	0.00	39.50	3.03	0.00	0.00
14.50	2.54	0.00	0.00	40.00	3.03	0.00	0.00
15.00	2.59	0.00	0.00	40.50	3.03	0.00	0.00
15.50	2.63	0.00	0.00	41.00	3.03	0.00	0.00
16.00	2.67	0.00	0.00	41.50	3.03	0.00	0.00
16.50	2.70	0.00	0.00	42.00	3.03	0.00	0.00
17.00	2.73	0.00	0.00	42.50	3.03	0.00	0.00
17.50	2.76	0.00	0.00	43.00	3.03	0.00	0.00
18.00	2.79	0.00	0.00	43.50	3.03	0.00	0.00
18.50	2.82	0.00	0.00	44.00	3.03	0.00	0.00
19.00	2.84	0.00	0.00	44.50	3.03	0.00	0.00
19.50	2.86	0.00	0.00	45.00	3.03	0.00	0.00
20.00	2.88	0.00	0.00	45.50	3.03	0.00	0.00
20.50	2.90	0.00	0.00	46.00	3.03	0.00	0.00
21.00	2.92	0.00	0.00	46.50	3.03	0.00	0.00
21.50	2.94	0.00	0.00	47.00	3.03	0.00	0.00
22.00	2.96	0.00	0.00	47.50	3.03	0.00	0.00
22.50	2.98	0.00	0.00	48.00	3.03	0.00	0.00
23.00	3.00	0.00	0.00				
23.50	3.01	0.00	0.00				
24.00	**3.03**	0.00	0.00				
24.50	3.03	0.00	0.00				
25.00	3.03	0.00	0.00				
25.50	3.03	0.00	0.00				
26.00	3.03	0.00	0.00				
26.50	3.03	0.00	0.00				
27.00	3.03	0.00	0.00				
27.50	3.03	0.00	0.00				
28.00	3.03	0.00	0.00				
28.50	3.03	0.00	0.00				
29.00	3.03	0.00	0.00				
29.50	3.03	0.00	0.00				
30.00	3.03	0.00	0.00				

Summary for Subcatchment 6S: DA-2

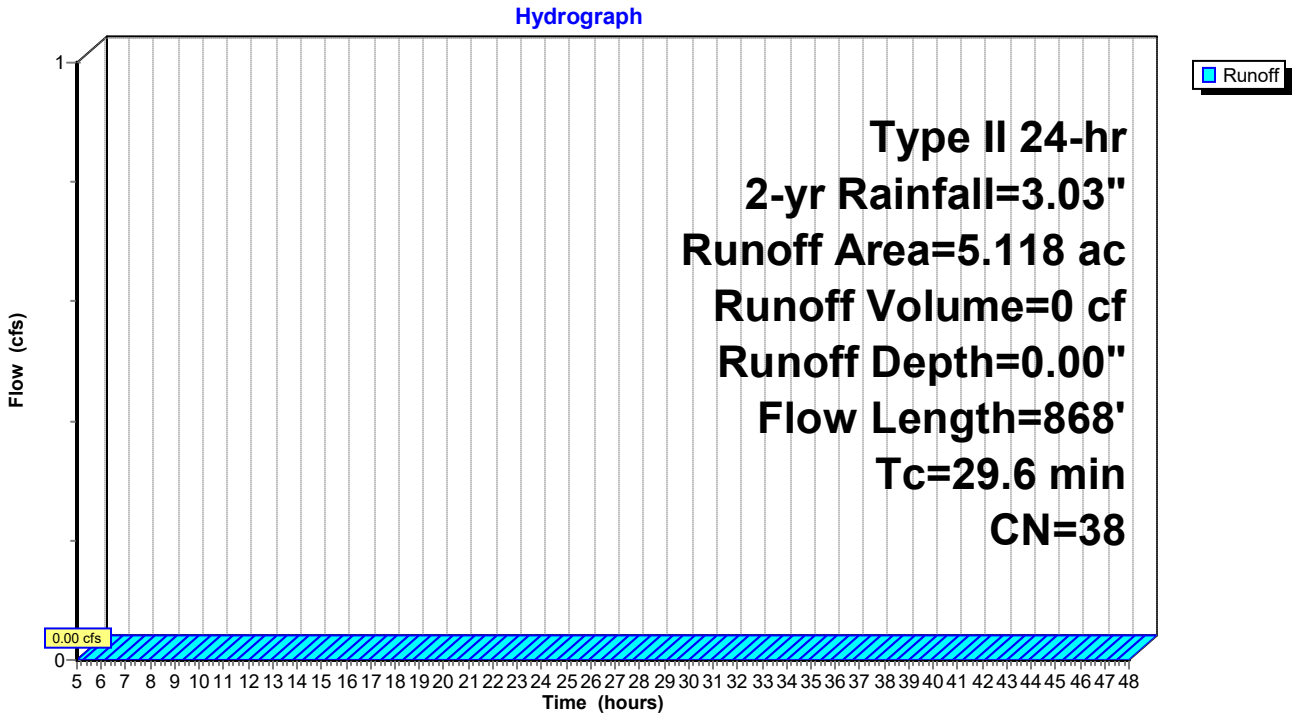
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.03"

	Area (ac)	CN	Description
	3.101	36	Woods, Fair, HSG A
	1.615	30	Meadow, non-grazed, HSG A
*	0.402	89	Gravel area
	5.118	38	Weighted Average
	5.118		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3	80	0.0500	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.5	262	0.0610	1.23		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	122	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	56	0.1070	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	232	0.0520	3.81	6.86	**Channel Flow, Diversion Channel** Area= 1.8 sf Perim= 5.0' r= 0.36' n= 0.045
2.1	116	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.6	868	Total			

Subcatchment 6S: DA-2



Hydrograph for Subcatchment 6S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.19	**0.00**	**0.00**	30.50	3.03	0.00	0.00
5.50	0.22	0.00	0.00	31.00	3.03	0.00	0.00
6.00	0.24	0.00	0.00	31.50	3.03	0.00	0.00
6.50	0.27	0.00	0.00	32.00	3.03	0.00	0.00
7.00	0.30	0.00	0.00	32.50	3.03	0.00	0.00
7.50	0.33	0.00	0.00	33.00	3.03	0.00	0.00
8.00	0.36	0.00	0.00	33.50	3.03	0.00	0.00
8.50	0.40	0.00	0.00	34.00	3.03	0.00	0.00
9.00	0.45	0.00	0.00	34.50	3.03	0.00	0.00
9.50	0.49	0.00	0.00	35.00	3.03	0.00	0.00
10.00	0.55	0.00	0.00	35.50	3.03	0.00	0.00
10.50	0.62	0.00	0.00	36.00	3.03	0.00	0.00
11.00	0.71	0.00	0.00	36.50	3.03	0.00	0.00
11.50	0.86	0.00	0.00	37.00	3.03	0.00	0.00
12.00	2.01	0.00	0.00	37.50	3.03	0.00	0.00
12.50	2.23	0.00	0.00	38.00	3.03	0.00	0.00
13.00	2.34	0.00	0.00	38.50	3.03	0.00	0.00
13.50	2.42	0.00	0.00	39.00	3.03	0.00	0.00
14.00	2.48	0.00	0.00	39.50	3.03	0.00	0.00
14.50	2.54	0.00	0.00	40.00	3.03	0.00	0.00
15.00	2.59	0.00	0.00	40.50	3.03	0.00	0.00
15.50	2.63	0.00	0.00	41.00	3.03	0.00	0.00
16.00	2.67	0.00	0.00	41.50	3.03	0.00	0.00
16.50	2.70	0.00	0.00	42.00	3.03	0.00	0.00
17.00	2.73	0.00	0.00	42.50	3.03	0.00	0.00
17.50	2.76	0.00	0.00	43.00	3.03	0.00	0.00
18.00	2.79	0.00	0.00	43.50	3.03	0.00	0.00
18.50	2.82	0.00	0.00	44.00	3.03	0.00	0.00
19.00	2.84	0.00	0.00	44.50	3.03	0.00	0.00
19.50	2.86	0.00	0.00	45.00	3.03	0.00	0.00
20.00	2.88	0.00	0.00	45.50	3.03	0.00	0.00
20.50	2.90	0.00	0.00	46.00	3.03	0.00	0.00
21.00	2.92	0.00	0.00	46.50	3.03	0.00	0.00
21.50	2.94	0.00	0.00	47.00	3.03	0.00	0.00
22.00	2.96	0.00	0.00	47.50	3.03	0.00	0.00
22.50	2.98	0.00	0.00	48.00	3.03	0.00	0.00
23.00	3.00	0.00	0.00				
23.50	3.01	0.00	0.00				
24.00	**3.03**	0.00	0.00				
24.50	3.03	0.00	0.00				
25.00	3.03	0.00	0.00				
25.50	3.03	0.00	0.00				
26.00	3.03	0.00	0.00				
26.50	3.03	0.00	0.00				
27.00	3.03	0.00	0.00				
27.50	3.03	0.00	0.00				
28.00	3.03	0.00	0.00				
28.50	3.03	0.00	0.00				
29.00	3.03	0.00	0.00				
29.50	3.03	0.00	0.00				
30.00	3.03	0.00	0.00				

Summary for Subcatchment 7S: DA-3

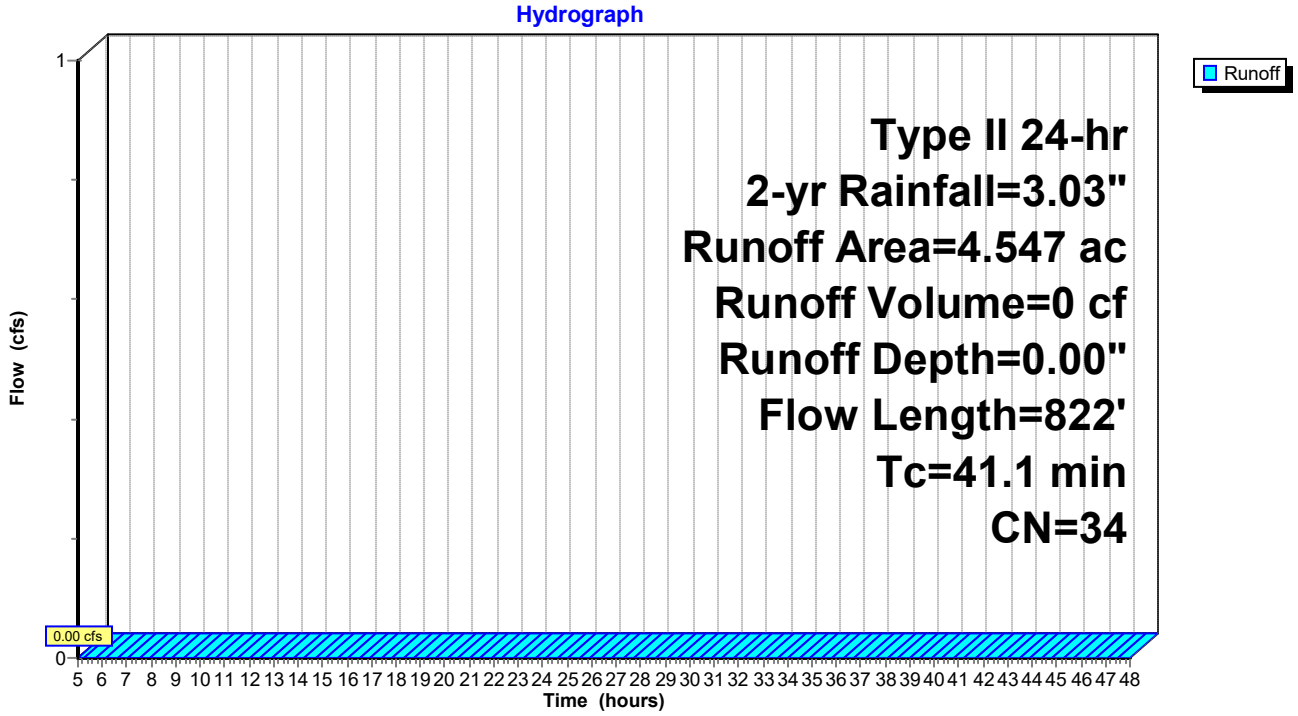
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.03"

Area (ac)	CN	Description
3.255	36	Woods, Fair, HSG A
1.292	30	Meadow, non-grazed, HSG A
4.547	34	Weighted Average
4.547		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.6	98	0.0250	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
5.8	592	0.1140	1.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	132	0.1780	2.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
41.1	822	Total			

Subcatchment 7S: DA-3



Hydrograph for Subcatchment 7S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.19	**0.00**	**0.00**	30.50	3.03	0.00	0.00
5.50	0.22	0.00	0.00	31.00	3.03	0.00	0.00
6.00	0.24	0.00	0.00	31.50	3.03	0.00	0.00
6.50	0.27	0.00	0.00	32.00	3.03	0.00	0.00
7.00	0.30	0.00	0.00	32.50	3.03	0.00	0.00
7.50	0.33	0.00	0.00	33.00	3.03	0.00	0.00
8.00	0.36	0.00	0.00	33.50	3.03	0.00	0.00
8.50	0.40	0.00	0.00	34.00	3.03	0.00	0.00
9.00	0.45	0.00	0.00	34.50	3.03	0.00	0.00
9.50	0.49	0.00	0.00	35.00	3.03	0.00	0.00
10.00	0.55	0.00	0.00	35.50	3.03	0.00	0.00
10.50	0.62	0.00	0.00	36.00	3.03	0.00	0.00
11.00	0.71	0.00	0.00	36.50	3.03	0.00	0.00
11.50	0.86	0.00	0.00	37.00	3.03	0.00	0.00
12.00	2.01	0.00	0.00	37.50	3.03	0.00	0.00
12.50	2.23	0.00	0.00	38.00	3.03	0.00	0.00
13.00	2.34	0.00	0.00	38.50	3.03	0.00	0.00
13.50	2.42	0.00	0.00	39.00	3.03	0.00	0.00
14.00	2.48	0.00	0.00	39.50	3.03	0.00	0.00
14.50	2.54	0.00	0.00	40.00	3.03	0.00	0.00
15.00	2.59	0.00	0.00	40.50	3.03	0.00	0.00
15.50	2.63	0.00	0.00	41.00	3.03	0.00	0.00
16.00	2.67	0.00	0.00	41.50	3.03	0.00	0.00
16.50	2.70	0.00	0.00	42.00	3.03	0.00	0.00
17.00	2.73	0.00	0.00	42.50	3.03	0.00	0.00
17.50	2.76	0.00	0.00	43.00	3.03	0.00	0.00
18.00	2.79	0.00	0.00	43.50	3.03	0.00	0.00
18.50	2.82	0.00	0.00	44.00	3.03	0.00	0.00
19.00	2.84	0.00	0.00	44.50	3.03	0.00	0.00
19.50	2.86	0.00	0.00	45.00	3.03	0.00	0.00
20.00	2.88	0.00	0.00	45.50	3.03	0.00	0.00
20.50	2.90	0.00	0.00	46.00	3.03	0.00	0.00
21.00	2.92	0.00	0.00	46.50	3.03	0.00	0.00
21.50	2.94	0.00	0.00	47.00	3.03	0.00	0.00
22.00	2.96	0.00	0.00	47.50	3.03	0.00	0.00
22.50	2.98	0.00	0.00	48.00	3.03	0.00	0.00
23.00	3.00	0.00	0.00				
23.50	3.01	0.00	0.00				
24.00	**3.03**	0.00	0.00				
24.50	3.03	0.00	0.00				
25.00	3.03	0.00	0.00				
25.50	3.03	0.00	0.00				
26.00	3.03	0.00	0.00				
26.50	3.03	0.00	0.00				
27.00	3.03	0.00	0.00				
27.50	3.03	0.00	0.00				
28.00	3.03	0.00	0.00				
28.50	3.03	0.00	0.00				
29.00	3.03	0.00	0.00				
29.50	3.03	0.00	0.00				
30.00	3.03	0.00	0.00				

Summary for Subcatchment 8S: DA-4

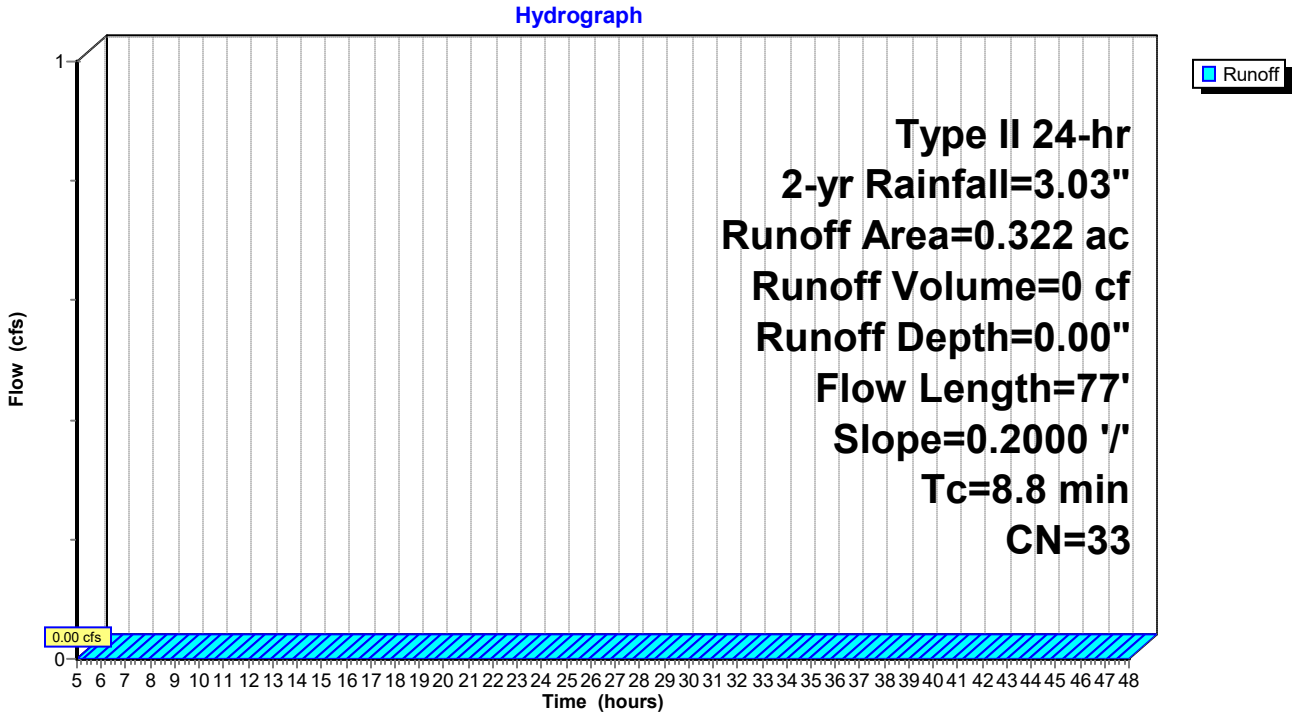
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.03"

Area (ac)	CN	Description
0.143	36	Woods, Fair, HSG A
0.179	30	Meadow, non-grazed, HSG A
0.322	33	Weighted Average
0.322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	40	0.2000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.03"
6.9	37	0.2000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
8.8	77	Total			

Subcatchment 8S: DA-4



Hydrograph for Subcatchment 8S: DA-4

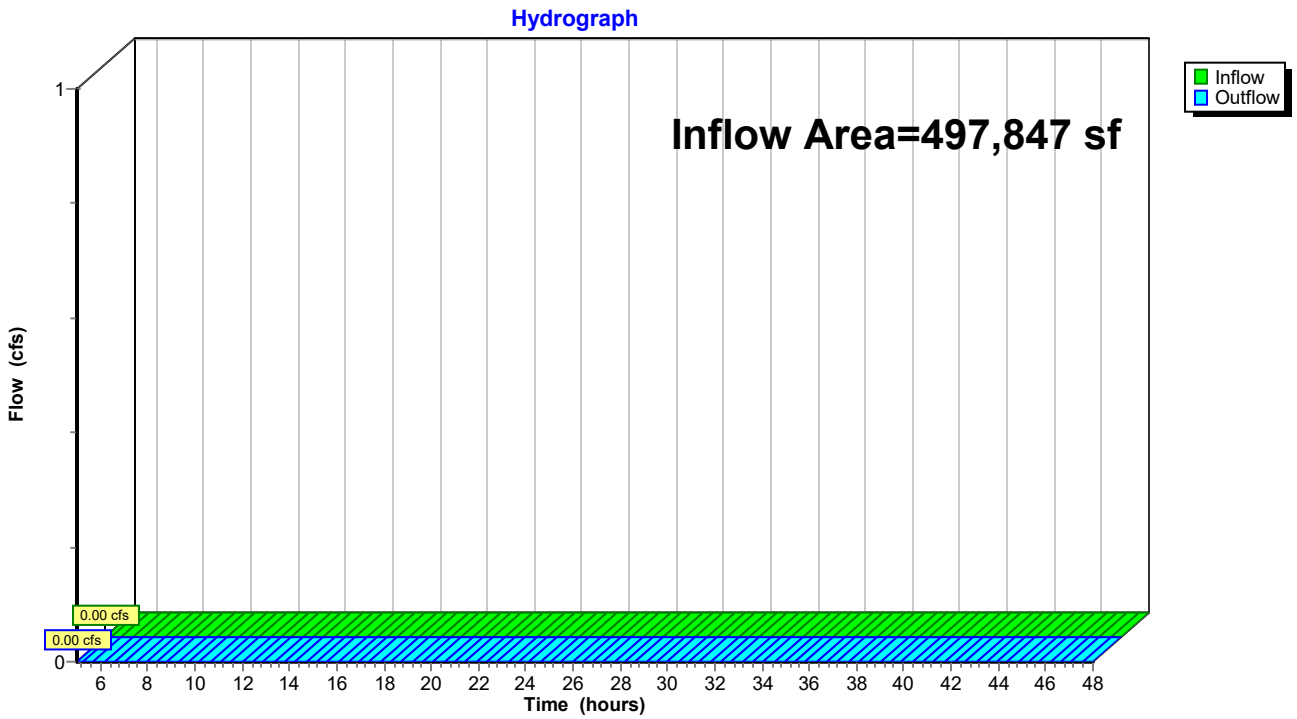
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.19	**0.00**	**0.00**	30.50	3.03	0.00	0.00
5.50	0.22	0.00	0.00	31.00	3.03	0.00	0.00
6.00	0.24	0.00	0.00	31.50	3.03	0.00	0.00
6.50	0.27	0.00	0.00	32.00	3.03	0.00	0.00
7.00	0.30	0.00	0.00	32.50	3.03	0.00	0.00
7.50	0.33	0.00	0.00	33.00	3.03	0.00	0.00
8.00	0.36	0.00	0.00	33.50	3.03	0.00	0.00
8.50	0.40	0.00	0.00	34.00	3.03	0.00	0.00
9.00	0.45	0.00	0.00	34.50	3.03	0.00	0.00
9.50	0.49	0.00	0.00	35.00	3.03	0.00	0.00
10.00	0.55	0.00	0.00	35.50	3.03	0.00	0.00
10.50	0.62	0.00	0.00	36.00	3.03	0.00	0.00
11.00	0.71	0.00	0.00	36.50	3.03	0.00	0.00
11.50	0.86	0.00	0.00	37.00	3.03	0.00	0.00
12.00	2.01	0.00	0.00	37.50	3.03	0.00	0.00
12.50	2.23	0.00	0.00	38.00	3.03	0.00	0.00
13.00	2.34	0.00	0.00	38.50	3.03	0.00	0.00
13.50	2.42	0.00	0.00	39.00	3.03	0.00	0.00
14.00	2.48	0.00	0.00	39.50	3.03	0.00	0.00
14.50	2.54	0.00	0.00	40.00	3.03	0.00	0.00
15.00	2.59	0.00	0.00	40.50	3.03	0.00	0.00
15.50	2.63	0.00	0.00	41.00	3.03	0.00	0.00
16.00	2.67	0.00	0.00	41.50	3.03	0.00	0.00
16.50	2.70	0.00	0.00	42.00	3.03	0.00	0.00
17.00	2.73	0.00	0.00	42.50	3.03	0.00	0.00
17.50	2.76	0.00	0.00	43.00	3.03	0.00	0.00
18.00	2.79	0.00	0.00	43.50	3.03	0.00	0.00
18.50	2.82	0.00	0.00	44.00	3.03	0.00	0.00
19.00	2.84	0.00	0.00	44.50	3.03	0.00	0.00
19.50	2.86	0.00	0.00	45.00	3.03	0.00	0.00
20.00	2.88	0.00	0.00	45.50	3.03	0.00	0.00
20.50	2.90	0.00	0.00	46.00	3.03	0.00	0.00
21.00	2.92	0.00	0.00	46.50	3.03	0.00	0.00
21.50	2.94	0.00	0.00	47.00	3.03	0.00	0.00
22.00	2.96	0.00	0.00	47.50	3.03	0.00	0.00
22.50	2.98	0.00	0.00	48.00	3.03	0.00	0.00
23.00	3.00	0.00	0.00				
23.50	3.01	0.00	0.00				
24.00	**3.03**	0.00	0.00				
24.50	3.03	0.00	0.00				
25.00	3.03	0.00	0.00				
25.50	3.03	0.00	0.00				
26.00	3.03	0.00	0.00				
26.50	3.03	0.00	0.00				
27.00	3.03	0.00	0.00				
27.50	3.03	0.00	0.00				
28.00	3.03	0.00	0.00				
28.50	3.03	0.00	0.00				
29.00	3.03	0.00	0.00				
29.50	3.03	0.00	0.00				
30.00	3.03	0.00	0.00				

Summary for Reach 10R: Post w/BMP

Inflow Area = 497,847 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/BMP



Hydrograph for Reach 10R: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	**0.00**		**0.00**	30.50	0.00		0.00
5.50	0.00		0.00	31.00	0.00		0.00
6.00	0.00		0.00	31.50	0.00		0.00
6.50	0.00		0.00	32.00	0.00		0.00
7.00	0.00		0.00	32.50	0.00		0.00
7.50	0.00		0.00	33.00	0.00		0.00
8.00	0.00		0.00	33.50	0.00		0.00
8.50	0.00		0.00	34.00	0.00		0.00
9.00	0.00		0.00	34.50	0.00		0.00
9.50	0.00		0.00	35.00	0.00		0.00
10.00	0.00		0.00	35.50	0.00		0.00
10.50	0.00		0.00	36.00	0.00		0.00
11.00	0.00		0.00	36.50	0.00		0.00
11.50	0.00		0.00	37.00	0.00		0.00
12.00	0.00		0.00	37.50	0.00		0.00
12.50	0.00		0.00	38.00	0.00		0.00
13.00	0.00		0.00	38.50	0.00		0.00
13.50	0.00		0.00	39.00	0.00		0.00
14.00	0.00		0.00	39.50	0.00		0.00
14.50	0.00		0.00	40.00	0.00		0.00
15.00	0.00		0.00	40.50	0.00		0.00
15.50	0.00		0.00	41.00	0.00		0.00
16.00	0.00		0.00	41.50	0.00		0.00
16.50	0.00		0.00	42.00	0.00		0.00
17.00	0.00		0.00	42.50	0.00		0.00
17.50	0.00		0.00	43.00	0.00		0.00
18.00	0.00		0.00	43.50	0.00		0.00
18.50	0.00		0.00	44.00	0.00		0.00
19.00	0.00		0.00	44.50	0.00		0.00
19.50	0.00		0.00	45.00	0.00		0.00
20.00	0.00		0.00	45.50	0.00		0.00
20.50	0.00		0.00	46.00	0.00		0.00
21.00	0.00		0.00	46.50	0.00		0.00
21.50	0.00		0.00	47.00	0.00		0.00
22.00	0.00		0.00	47.50	0.00		0.00
22.50	0.00		0.00	48.00	0.00		0.00
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				

Summary for Pond 6P: Wet Pond

Inflow Area = 222,940 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,242.50' @ 5.00 hrs Surf.Area= 2,285 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

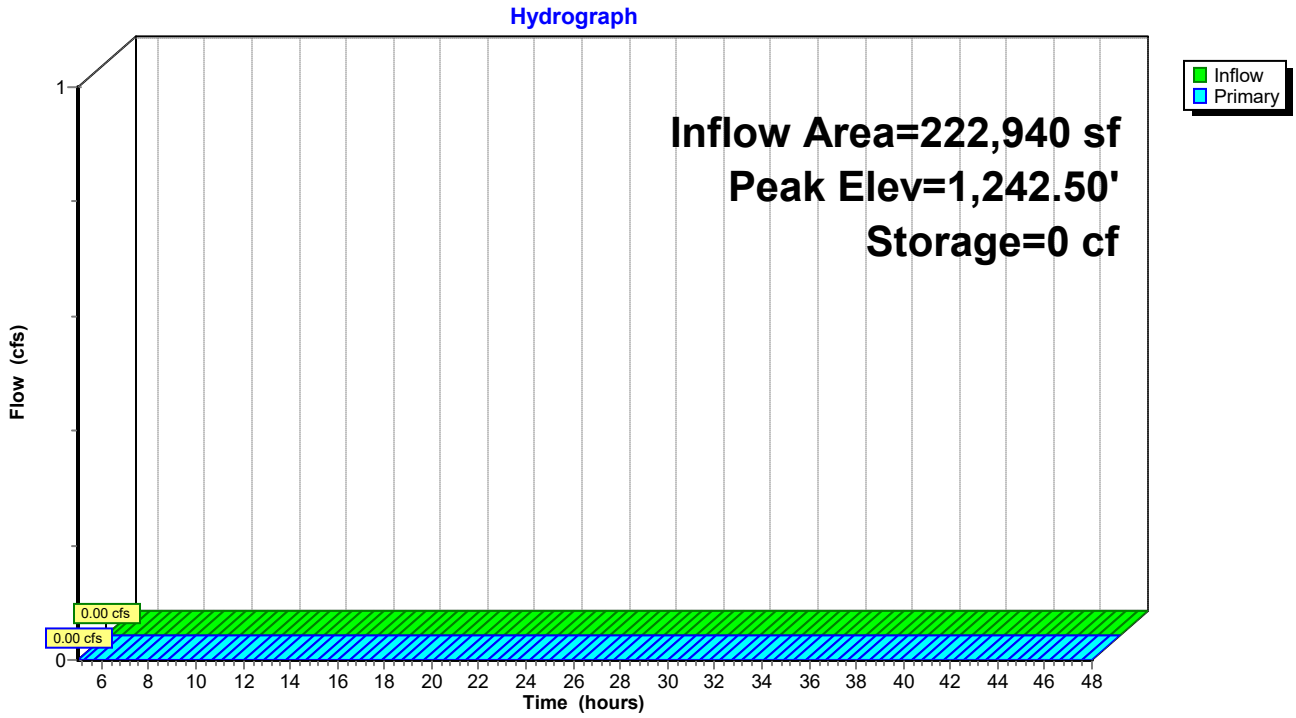
Volume	Invert	Avail.Storage	Storage Description
#1	1,242.50'	48,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,242.50	2,285	0	0
1,244.00	3,425	4,283	4,283
1,246.00	5,081	8,506	12,789
1,248.00	6,932	12,013	24,802
1,250.00	8,031	14,963	39,765
1,251.00	10,320	9,176	48,940

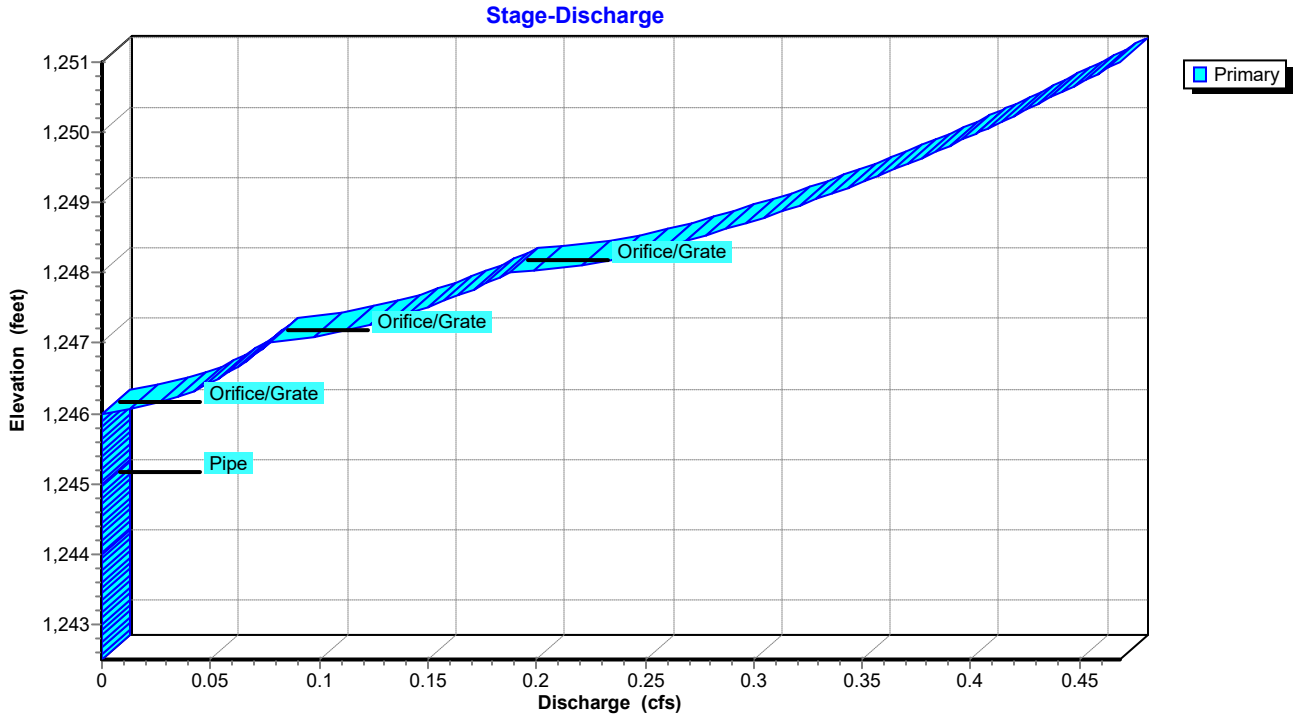
Device	Routing	Invert	Outlet Devices
#1	Primary	1,245.00'	**15.0" Round Pipe** L= 100.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,245.00' / 1,243.00' S= 0.0200 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	1,246.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	1,247.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,248.00'	**1.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,242.50' (Free Discharge)
└─**1=Pipe** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Wet Pond



Pond 6P: Wet Pond



Hydrograph for Pond 6P: Wet Pond

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	**0.00**	**1,242.50**	**0.00**	30.50	0.00	1,242.50	0.00
5.50	0.00	1,242.50	0.00	31.00	0.00	1,242.50	0.00
6.00	0.00	1,242.50	0.00	31.50	0.00	1,242.50	0.00
6.50	0.00	1,242.50	0.00	32.00	0.00	1,242.50	0.00
7.00	0.00	1,242.50	0.00	32.50	0.00	1,242.50	0.00
7.50	0.00	1,242.50	0.00	33.00	0.00	1,242.50	0.00
8.00	0.00	1,242.50	0.00	33.50	0.00	1,242.50	0.00
8.50	0.00	1,242.50	0.00	34.00	0.00	1,242.50	0.00
9.00	0.00	1,242.50	0.00	34.50	0.00	1,242.50	0.00
9.50	0.00	1,242.50	0.00	35.00	0.00	1,242.50	0.00
10.00	0.00	1,242.50	0.00	35.50	0.00	1,242.50	0.00
10.50	0.00	1,242.50	0.00	36.00	0.00	1,242.50	0.00
11.00	0.00	1,242.50	0.00	36.50	0.00	1,242.50	0.00
11.50	0.00	1,242.50	0.00	37.00	0.00	1,242.50	0.00
12.00	0.00	1,242.50	0.00	37.50	0.00	1,242.50	0.00
12.50	0.00	1,242.50	0.00	38.00	0.00	1,242.50	0.00
13.00	0.00	1,242.50	0.00	38.50	0.00	1,242.50	0.00
13.50	0.00	1,242.50	0.00	39.00	0.00	1,242.50	0.00
14.00	0.00	1,242.50	0.00	39.50	0.00	1,242.50	0.00
14.50	0.00	1,242.50	0.00	40.00	0.00	1,242.50	0.00
15.00	0.00	1,242.50	0.00	40.50	0.00	1,242.50	0.00
15.50	0.00	1,242.50	0.00	41.00	0.00	1,242.50	0.00
16.00	0.00	1,242.50	0.00	41.50	0.00	1,242.50	0.00
16.50	0.00	1,242.50	0.00	42.00	0.00	1,242.50	0.00
17.00	0.00	1,242.50	0.00	42.50	0.00	1,242.50	0.00
17.50	0.00	1,242.50	0.00	43.00	0.00	1,242.50	0.00
18.00	0.00	1,242.50	0.00	43.50	0.00	1,242.50	0.00
18.50	0.00	1,242.50	0.00	44.00	0.00	1,242.50	0.00
19.00	0.00	1,242.50	0.00	44.50	0.00	1,242.50	0.00
19.50	0.00	1,242.50	0.00	45.00	0.00	1,242.50	0.00
20.00	0.00	1,242.50	0.00	45.50	0.00	1,242.50	0.00
20.50	0.00	1,242.50	0.00	46.00	0.00	1,242.50	0.00
21.00	0.00	1,242.50	0.00	46.50	0.00	1,242.50	0.00
21.50	0.00	1,242.50	0.00	47.00	0.00	1,242.50	0.00
22.00	0.00	1,242.50	0.00	47.50	0.00	1,242.50	0.00
22.50	0.00	1,242.50	0.00	48.00	0.00	1,242.50	0.00
23.00	0.00	1,242.50	0.00				
23.50	0.00	1,242.50	0.00				
24.00	0.00	1,242.50	0.00				
24.50	0.00	1,242.50	0.00				
25.00	0.00	1,242.50	0.00				
25.50	0.00	1,242.50	0.00				
26.00	0.00	1,242.50	0.00				
26.50	0.00	1,242.50	0.00				
27.00	0.00	1,242.50	0.00				
27.50	0.00	1,242.50	0.00				
28.00	0.00	1,242.50	0.00				
28.50	0.00	1,242.50	0.00				
29.00	0.00	1,242.50	0.00				
29.50	0.00	1,242.50	0.00				
30.00	0.00	1,242.50	0.00				

Stage-Discharge for Pond 6P: Wet Pond

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,242.50	0.00	1,247.60	0.16
1,242.60	0.00	1,247.70	0.17
1,242.70	0.00	1,247.80	0.17
1,242.80	0.00	1,247.90	0.18
1,242.90	0.00	1,248.00	0.19
1,243.00	0.00	1,248.10	0.22
1,243.10	0.00	1,248.20	0.24
1,243.20	0.00	1,248.30	0.25
1,243.30	0.00	1,248.40	0.26
1,243.40	0.00	1,248.50	0.27
1,243.50	0.00	1,248.60	0.29
1,243.60	0.00	1,248.70	0.30
1,243.70	0.00	1,248.80	0.31
1,243.80	0.00	1,248.90	0.32
1,243.90	0.00	1,249.00	0.32
1,244.00	0.00	1,249.10	0.33
1,244.10	0.00	1,249.20	0.34
1,244.20	0.00	1,249.30	0.35
1,244.30	0.00	1,249.40	0.36
1,244.40	0.00	1,249.50	0.37
1,244.50	0.00	1,249.60	0.37
1,244.60	0.00	1,249.70	0.38
1,244.70	0.00	1,249.80	0.39
1,244.80	0.00	1,249.90	0.40
1,244.90	0.00	1,250.00	0.40
1,245.00	0.00	1,250.10	0.41
1,245.10	0.00	1,250.20	0.42
1,245.20	0.00	1,250.30	0.42
1,245.30	0.00	1,250.40	0.43
1,245.40	0.00	1,250.50	0.44
1,245.50	0.00	1,250.60	0.44
1,245.60	0.00	1,250.70	0.45
1,245.70	0.00	1,250.80	0.46
1,245.80	0.00	1,250.90	0.46
1,245.90	0.00	1,251.00	**0.47**
1,246.00	0.00		
1,246.10	0.02		
1,246.20	0.03		
1,246.30	0.04		
1,246.40	0.05		
1,246.50	0.05		
1,246.60	0.06		
1,246.70	0.06		
1,246.80	0.07		
1,246.90	0.07		
1,247.00	0.08		
1,247.10	0.10		
1,247.20	0.12		
1,247.30	0.13		
1,247.40	0.14		
1,247.50	0.15		

Stage-Area-Storage for Pond 6P: Wet Pond

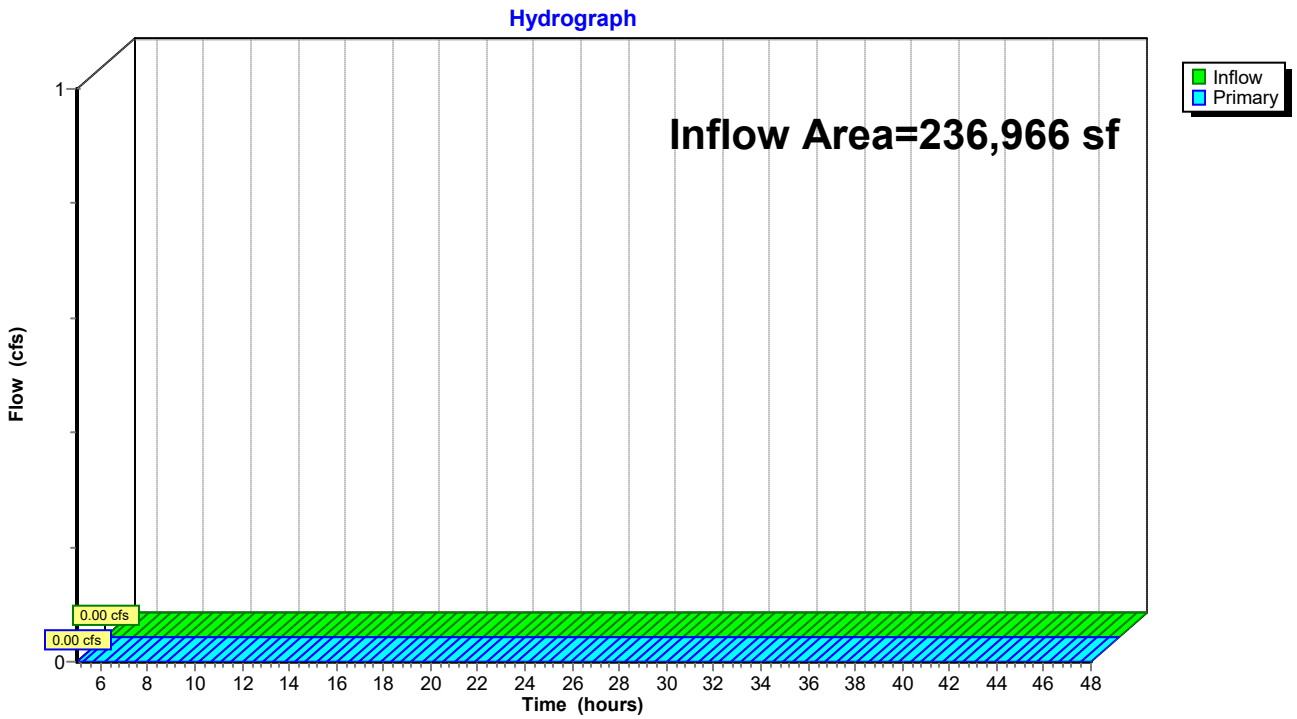
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,242.50	2,285	0
1,242.60	2,361	232
1,242.70	2,437	472
1,242.80	2,513	720
1,242.90	2,589	975
1,243.00	2,665	1,238
1,243.10	2,741	1,508
1,243.20	2,817	1,786
1,243.30	2,893	2,071
1,243.40	2,969	2,364
1,243.50	3,045	2,665
1,243.60	3,121	2,973
1,243.70	3,197	3,289
1,243.80	3,273	3,613
1,243.90	3,349	3,944
1,244.00	3,425	4,283
1,244.10	3,508	4,629
1,244.20	3,591	4,984
1,244.30	3,673	5,347
1,244.40	3,756	5,719
1,244.50	3,839	6,099
1,244.60	3,922	6,487
1,244.70	4,005	6,883
1,244.80	4,087	7,287
1,244.90	4,170	7,700
1,245.00	4,253	8,122
1,245.10	4,336	8,551
1,245.20	4,419	8,989
1,245.30	4,501	9,435
1,245.40	4,584	9,889
1,245.50	4,667	10,352
1,245.60	4,750	10,822
1,245.70	4,833	11,301
1,245.80	4,915	11,789
1,245.90	4,998	12,285
1,246.00	5,081	12,789
1,246.10	5,174	13,301
1,246.20	5,266	13,823
1,246.30	5,359	14,354
1,246.40	5,451	14,895
1,246.50	5,544	15,445
1,246.60	5,636	16,004
1,246.70	5,729	16,572
1,246.80	5,821	17,149
1,246.90	5,914	17,736
1,247.00	6,007	18,332
1,247.10	6,099	18,938
1,247.20	6,192	19,552
1,247.30	6,284	20,176
1,247.40	6,377	20,809
1,247.50	6,469	21,451
1,247.60	6,562	22,103
1,247.70	6,654	22,764
1,247.80	6,747	23,434
1,247.90	6,839	24,113
1,248.00	6,932	24,802
1,248.10	6,987	25,497
1,248.20	7,042	26,199
1,248.30	7,097	26,906
1,248.40	7,152	27,618
1,248.50	7,207	28,336
1,248.60	7,262	29,060
1,248.70	7,317	29,789
1,248.80	7,372	30,523
1,248.90	7,427	31,263
1,249.00	7,482	32,008
1,249.10	7,536	32,759
1,249.20	7,591	33,516
1,249.30	7,646	34,277
1,249.40	7,701	35,045
1,249.50	7,756	35,818
1,249.60	7,811	36,596
1,249.70	7,866	37,380
1,249.80	7,921	38,169
1,249.90	7,976	38,964
1,250.00	8,031	39,765
1,250.10	8,260	40,579
1,250.20	8,489	41,416
1,250.30	8,718	42,277
1,250.40	8,947	43,160
1,250.50	9,176	44,066
1,250.60	9,404	44,995
1,250.70	9,633	45,947
1,250.80	9,862	46,922
1,250.90	10,091	47,919
1,251.00	**10,320**	**48,940**

Summary for Link 5L:

Inflow Area = 236,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Link 5L:



Hydrograph for Link 5L:

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	**0.00**	**0.00**	**0.00**	30.50	0.00	0.00	0.00
5.50	0.00	0.00	0.00	31.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	31.50	0.00	0.00	0.00
6.50	0.00	0.00	0.00	32.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	32.50	0.00	0.00	0.00
7.50	0.00	0.00	0.00	33.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	33.50	0.00	0.00	0.00
8.50	0.00	0.00	0.00	34.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	34.50	0.00	0.00	0.00
9.50	0.00	0.00	0.00	35.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	35.50	0.00	0.00	0.00
10.50	0.00	0.00	0.00	36.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	36.50	0.00	0.00	0.00
11.50	0.00	0.00	0.00	37.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	37.50	0.00	0.00	0.00
12.50	0.00	0.00	0.00	38.00	0.00	0.00	0.00
13.00	0.00	0.00	0.00	38.50	0.00	0.00	0.00
13.50	0.00	0.00	0.00	39.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	39.50	0.00	0.00	0.00
14.50	0.00	0.00	0.00	40.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	40.50	0.00	0.00	0.00
15.50	0.00	0.00	0.00	41.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	41.50	0.00	0.00	0.00
16.50	0.00	0.00	0.00	42.00	0.00	0.00	0.00
17.00	0.00	0.00	0.00	42.50	0.00	0.00	0.00
17.50	0.00	0.00	0.00	43.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00	43.50	0.00	0.00	0.00
18.50	0.00	0.00	0.00	44.00	0.00	0.00	0.00
19.00	0.00	0.00	0.00	44.50	0.00	0.00	0.00
19.50	0.00	0.00	0.00	45.00	0.00	0.00	0.00
20.00	0.00	0.00	0.00	45.50	0.00	0.00	0.00
20.50	0.00	0.00	0.00	46.00	0.00	0.00	0.00
21.00	0.00	0.00	0.00	46.50	0.00	0.00	0.00
21.50	0.00	0.00	0.00	47.00	0.00	0.00	0.00
22.00	0.00	0.00	0.00	47.50	0.00	0.00	0.00
22.50	0.00	0.00	0.00	48.00	0.00	0.00	0.00
23.00	0.00	0.00	0.00				
23.50	0.00	0.00	0.00				
24.00	0.00	0.00	0.00				
24.50	0.00	0.00	0.00				
25.00	0.00	0.00	0.00				
25.50	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
26.50	0.00	0.00	0.00				
27.00	0.00	0.00	0.00				
27.50	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
28.50	0.00	0.00	0.00				
29.00	0.00	0.00	0.00				
29.50	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.442 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=561' Tc=19.7 min CN=33 Runoff=0.00 cfs 0 cf

Subcatchment 6S: DA-2 Runoff Area=5.118 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=868' Tc=29.6 min CN=38 Runoff=0.01 cfs 252 cf

Subcatchment 7S: DA-3 Runoff Area=4.547 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=822' Tc=41.1 min CN=34 Runoff=0.00 cfs 0 cf

Subcatchment 8S: DA-4 Runoff Area=0.322 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=77' Slope=0.2000 '/' Tc=8.8 min CN=33 Runoff=0.00 cfs 0 cf

Reach 10R: Post w/BMP Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond 6P: Wet Pond Peak Elev=1,242.61' Storage=251 cf Inflow=0.01 cfs 252 cf
Outflow=0.00 cfs 0 cf

Link 5L: Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 497,847 sf Runoff Volume = 252 cf Average Runoff Depth = 0.01"
100.00% Pervious = 497,847 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

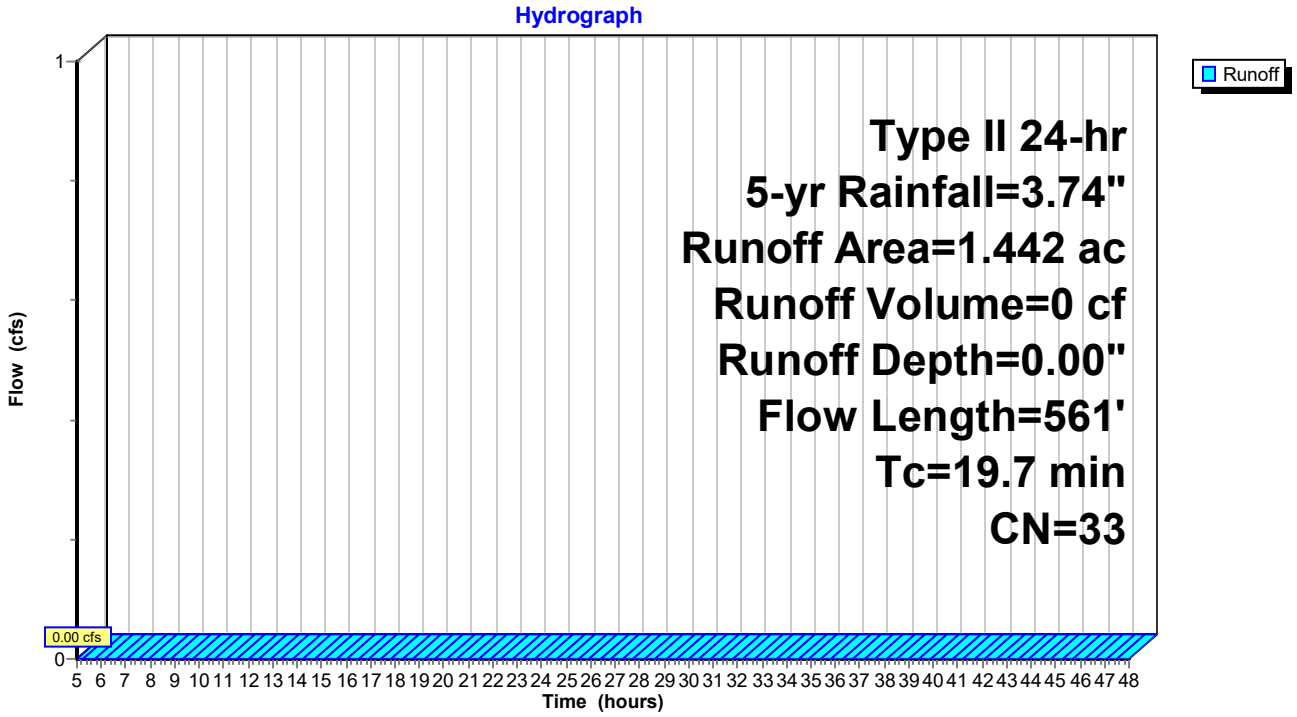
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-yr Rainfall=3.74"

Area (ac)	CN	Description
0.707	36	Woods, Fair, HSG A
0.735	30	Meadow, non-grazed, HSG A
1.442	33	Weighted Average
1.442		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	76	0.1050	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.8	485	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	561	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.24	**0.00**	**0.00**	30.50	3.74	0.00	0.00
5.50	0.27	0.00	0.00	31.00	3.74	0.00	0.00
6.00	0.30	0.00	0.00	31.50	3.74	0.00	0.00
6.50	0.33	0.00	0.00	32.00	3.74	0.00	0.00
7.00	0.37	0.00	0.00	32.50	3.74	0.00	0.00
7.50	0.41	0.00	0.00	33.00	3.74	0.00	0.00
8.00	0.45	0.00	0.00	33.50	3.74	0.00	0.00
8.50	0.49	0.00	0.00	34.00	3.74	0.00	0.00
9.00	0.55	0.00	0.00	34.50	3.74	0.00	0.00
9.50	0.61	0.00	0.00	35.00	3.74	0.00	0.00
10.00	0.68	0.00	0.00	35.50	3.74	0.00	0.00
10.50	0.76	0.00	0.00	36.00	3.74	0.00	0.00
11.00	0.88	0.00	0.00	36.50	3.74	0.00	0.00
11.50	1.06	0.00	0.00	37.00	3.74	0.00	0.00
12.00	2.48	0.00	0.00	37.50	3.74	0.00	0.00
12.50	2.75	0.00	0.00	38.00	3.74	0.00	0.00
13.00	2.89	0.00	0.00	38.50	3.74	0.00	0.00
13.50	2.99	0.00	0.00	39.00	3.74	0.00	0.00
14.00	3.07	0.00	0.00	39.50	3.74	0.00	0.00
14.50	3.13	0.00	0.00	40.00	3.74	0.00	0.00
15.00	3.19	0.00	0.00	40.50	3.74	0.00	0.00
15.50	3.24	0.00	0.00	41.00	3.74	0.00	0.00
16.00	3.29	0.00	0.00	41.50	3.74	0.00	0.00
16.50	3.33	0.00	0.00	42.00	3.74	0.00	0.00
17.00	3.37	0.00	0.00	42.50	3.74	0.00	0.00
17.50	3.41	0.00	0.00	43.00	3.74	0.00	0.00
18.00	3.44	0.00	0.00	43.50	3.74	0.00	0.00
18.50	3.48	0.00	0.00	44.00	3.74	0.00	0.00
19.00	3.51	0.00	0.00	44.50	3.74	0.00	0.00
19.50	3.54	0.00	0.00	45.00	3.74	0.00	0.00
20.00	3.56	0.00	0.00	45.50	3.74	0.00	0.00
20.50	3.58	0.00	0.00	46.00	3.74	0.00	0.00
21.00	3.61	0.00	0.00	46.50	3.74	0.00	0.00
21.50	3.63	0.00	0.00	47.00	3.74	0.00	0.00
22.00	3.65	0.00	0.00	47.50	3.74	0.00	0.00
22.50	3.68	0.00	0.00	48.00	3.74	0.00	0.00
23.00	3.70	0.00	0.00				
23.50	3.72	0.00	0.00				
24.00	**3.74**	0.00	0.00				
24.50	3.74	0.00	0.00				
25.00	3.74	0.00	0.00				
25.50	3.74	0.00	0.00				
26.00	3.74	0.00	0.00				
26.50	3.74	0.00	0.00				
27.00	3.74	0.00	0.00				
27.50	3.74	0.00	0.00				
28.00	3.74	0.00	0.00				
28.50	3.74	0.00	0.00				
29.00	3.74	0.00	0.00				
29.50	3.74	0.00	0.00				
30.00	3.74	0.00	0.00				

Summary for Subcatchment 6S: DA-2

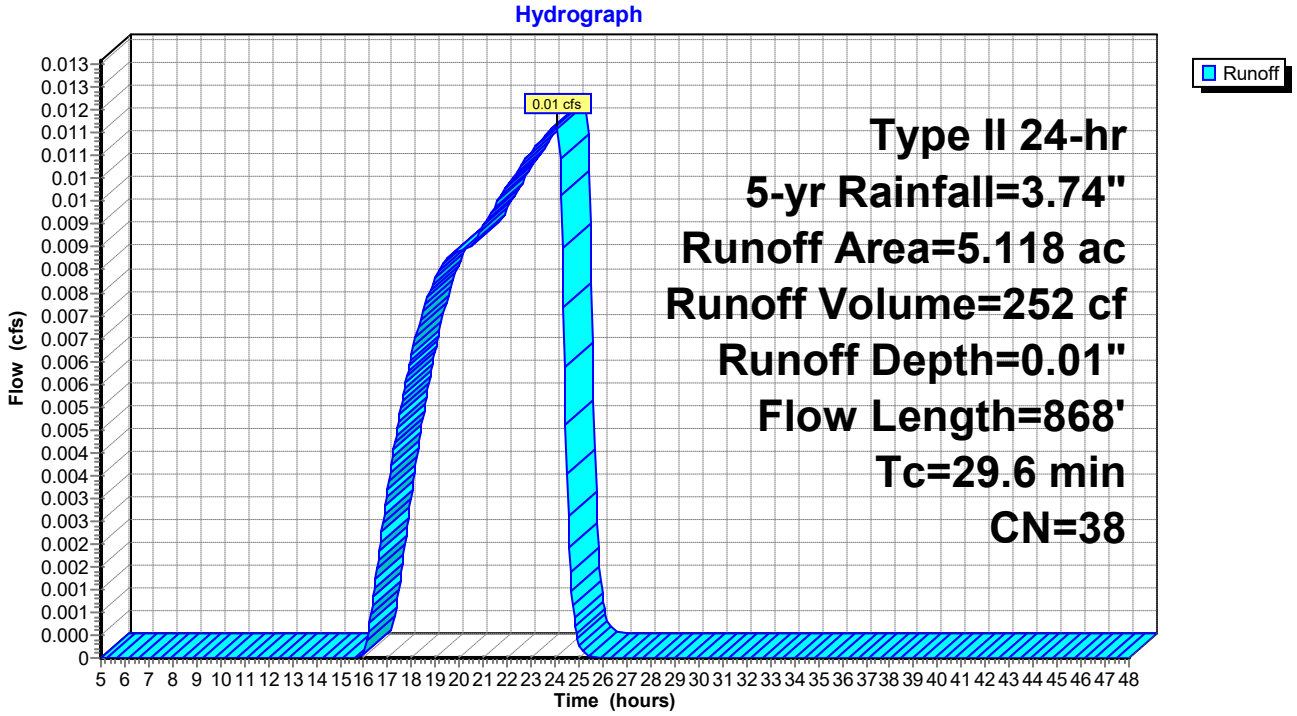
Runoff = 0.01 cfs @ 24.04 hrs, Volume= 252 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-yr Rainfall=3.74"

	Area (ac)	CN	Description
	3.101	36	Woods, Fair, HSG A
	1.615	30	Meadow, non-grazed, HSG A
*	0.402	89	Gravel area
	5.118	38	Weighted Average
	5.118		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3	80	0.0500	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.5	262	0.0610	1.23		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	122	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	56	0.1070	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	232	0.0520	3.81	6.86	**Channel Flow, Diversion Channel** Area= 1.8 sf Perim= 5.0' r= 0.36' n= 0.045
2.1	116	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.6	868	Total			

Subcatchment 6S: DA-2



Hydrograph for Subcatchment 6S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.24	0.00	0.00
5.50	0.27	0.00	0.00
6.00	0.30	0.00	0.00
6.50	0.33	0.00	0.00
7.00	0.37	0.00	0.00
7.50	0.41	0.00	0.00
8.00	0.45	0.00	0.00
8.50	0.49	0.00	0.00
9.00	0.55	0.00	0.00
9.50	0.61	0.00	0.00
10.00	0.68	0.00	0.00
10.50	0.76	0.00	0.00
11.00	0.88	0.00	0.00
11.50	1.06	0.00	0.00
12.00	2.48	0.00	0.00
12.50	2.75	0.00	0.00
13.00	2.89	0.00	0.00
13.50	2.99	0.00	0.00
14.00	3.07	0.00	0.00
14.50	3.13	0.00	0.00
15.00	3.19	0.00	0.00
15.50	3.24	0.00	0.00
16.00	3.29	0.00	0.00
16.50	3.33	0.00	0.00
17.00	3.37	0.00	0.00
17.50	3.41	0.00	0.01
18.00	3.44	0.00	0.01
18.50	3.48	0.00	0.01
19.00	3.51	0.00	0.01
19.50	3.54	0.00	0.01
20.00	3.56	0.01	0.01
20.50	3.58	0.01	0.01
21.00	3.61	0.01	0.01
21.50	3.63	0.01	0.01
22.00	3.65	0.01	0.01
22.50	3.68	0.01	0.01
23.00	3.70	0.01	0.01
23.50	3.72	0.01	0.01
24.00	**3.74**	**0.01**	**0.01**
24.50	3.74	0.01	**0.00**
25.00	3.74	0.01	0.00
25.50	3.74	0.01	0.00
26.00	3.74	0.01	0.00
26.50	3.74	0.01	0.00
27.00	3.74	0.01	0.00
27.50	3.74	0.01	0.00
28.00	3.74	0.01	0.00
28.50	3.74	0.01	0.00
29.00	3.74	0.01	0.00
29.50	3.74	0.01	0.00
30.00	3.74	0.01	0.00
30.50	3.74	0.01	0.00
31.00	3.74	0.01	0.00
31.50	3.74	0.01	0.00
32.00	3.74	0.01	0.00
32.50	3.74	0.01	0.00
33.00	3.74	0.01	0.00
33.50	3.74	0.01	0.00
34.00	3.74	0.01	0.00
34.50	3.74	0.01	0.00
35.00	3.74	0.01	0.00
35.50	3.74	0.01	0.00
36.00	3.74	0.01	0.00
36.50	3.74	0.01	0.00
37.00	3.74	0.01	0.00
37.50	3.74	0.01	0.00
38.00	3.74	0.01	0.00
38.50	3.74	0.01	0.00
39.00	3.74	0.01	0.00
39.50	3.74	0.01	0.00
40.00	3.74	0.01	0.00
40.50	3.74	0.01	0.00
41.00	3.74	0.01	0.00
41.50	3.74	0.01	0.00
42.00	3.74	0.01	0.00
42.50	3.74	0.01	0.00
43.00	3.74	0.01	0.00
43.50	3.74	0.01	0.00
44.00	3.74	0.01	0.00
44.50	3.74	0.01	0.00
45.00	3.74	0.01	0.00
45.50	3.74	0.01	0.00
46.00	3.74	0.01	0.00
46.50	3.74	0.01	0.00
47.00	3.74	0.01	0.00
47.50	3.74	0.01	0.00
48.00	3.74	0.01	0.00

Summary for Subcatchment 7S: DA-3

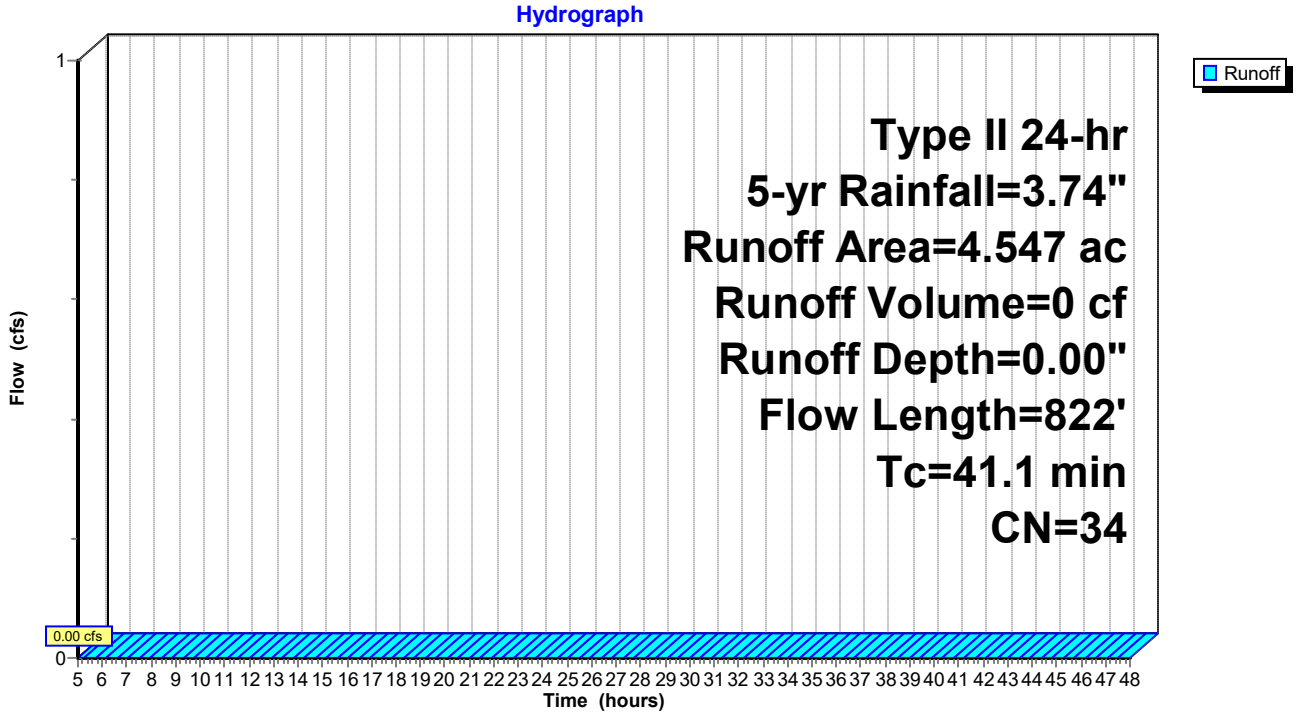
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-yr Rainfall=3.74"

Area (ac)	CN	Description
3.255	36	Woods, Fair, HSG A
1.292	30	Meadow, non-grazed, HSG A
4.547	34	Weighted Average
4.547		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.6	98	0.0250	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
5.8	592	0.1140	1.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	132	0.1780	2.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
41.1	822	Total			

Subcatchment 7S: DA-3



Hydrograph for Subcatchment 7S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.24	**0.00**	**0.00**	30.50	3.74	0.00	0.00
5.50	0.27	0.00	0.00	31.00	3.74	0.00	0.00
6.00	0.30	0.00	0.00	31.50	3.74	0.00	0.00
6.50	0.33	0.00	0.00	32.00	3.74	0.00	0.00
7.00	0.37	0.00	0.00	32.50	3.74	0.00	0.00
7.50	0.41	0.00	0.00	33.00	3.74	0.00	0.00
8.00	0.45	0.00	0.00	33.50	3.74	0.00	0.00
8.50	0.49	0.00	0.00	34.00	3.74	0.00	0.00
9.00	0.55	0.00	0.00	34.50	3.74	0.00	0.00
9.50	0.61	0.00	0.00	35.00	3.74	0.00	0.00
10.00	0.68	0.00	0.00	35.50	3.74	0.00	0.00
10.50	0.76	0.00	0.00	36.00	3.74	0.00	0.00
11.00	0.88	0.00	0.00	36.50	3.74	0.00	0.00
11.50	1.06	0.00	0.00	37.00	3.74	0.00	0.00
12.00	2.48	0.00	0.00	37.50	3.74	0.00	0.00
12.50	2.75	0.00	0.00	38.00	3.74	0.00	0.00
13.00	2.89	0.00	0.00	38.50	3.74	0.00	0.00
13.50	2.99	0.00	0.00	39.00	3.74	0.00	0.00
14.00	3.07	0.00	0.00	39.50	3.74	0.00	0.00
14.50	3.13	0.00	0.00	40.00	3.74	0.00	0.00
15.00	3.19	0.00	0.00	40.50	3.74	0.00	0.00
15.50	3.24	0.00	0.00	41.00	3.74	0.00	0.00
16.00	3.29	0.00	0.00	41.50	3.74	0.00	0.00
16.50	3.33	0.00	0.00	42.00	3.74	0.00	0.00
17.00	3.37	0.00	0.00	42.50	3.74	0.00	0.00
17.50	3.41	0.00	0.00	43.00	3.74	0.00	0.00
18.00	3.44	0.00	0.00	43.50	3.74	0.00	0.00
18.50	3.48	0.00	0.00	44.00	3.74	0.00	0.00
19.00	3.51	0.00	0.00	44.50	3.74	0.00	0.00
19.50	3.54	0.00	0.00	45.00	3.74	0.00	0.00
20.00	3.56	0.00	0.00	45.50	3.74	0.00	0.00
20.50	3.58	0.00	0.00	46.00	3.74	0.00	0.00
21.00	3.61	0.00	0.00	46.50	3.74	0.00	0.00
21.50	3.63	0.00	0.00	47.00	3.74	0.00	0.00
22.00	3.65	0.00	0.00	47.50	3.74	0.00	0.00
22.50	3.68	0.00	0.00	48.00	3.74	0.00	0.00
23.00	3.70	0.00	0.00				
23.50	3.72	0.00	0.00				
24.00	**3.74**	0.00	0.00				
24.50	3.74	0.00	0.00				
25.00	3.74	0.00	0.00				
25.50	3.74	0.00	0.00				
26.00	3.74	0.00	0.00				
26.50	3.74	0.00	0.00				
27.00	3.74	0.00	0.00				
27.50	3.74	0.00	0.00				
28.00	3.74	0.00	0.00				
28.50	3.74	0.00	0.00				
29.00	3.74	0.00	0.00				
29.50	3.74	0.00	0.00				
30.00	3.74	0.00	0.00				

Summary for Subcatchment 8S: DA-4

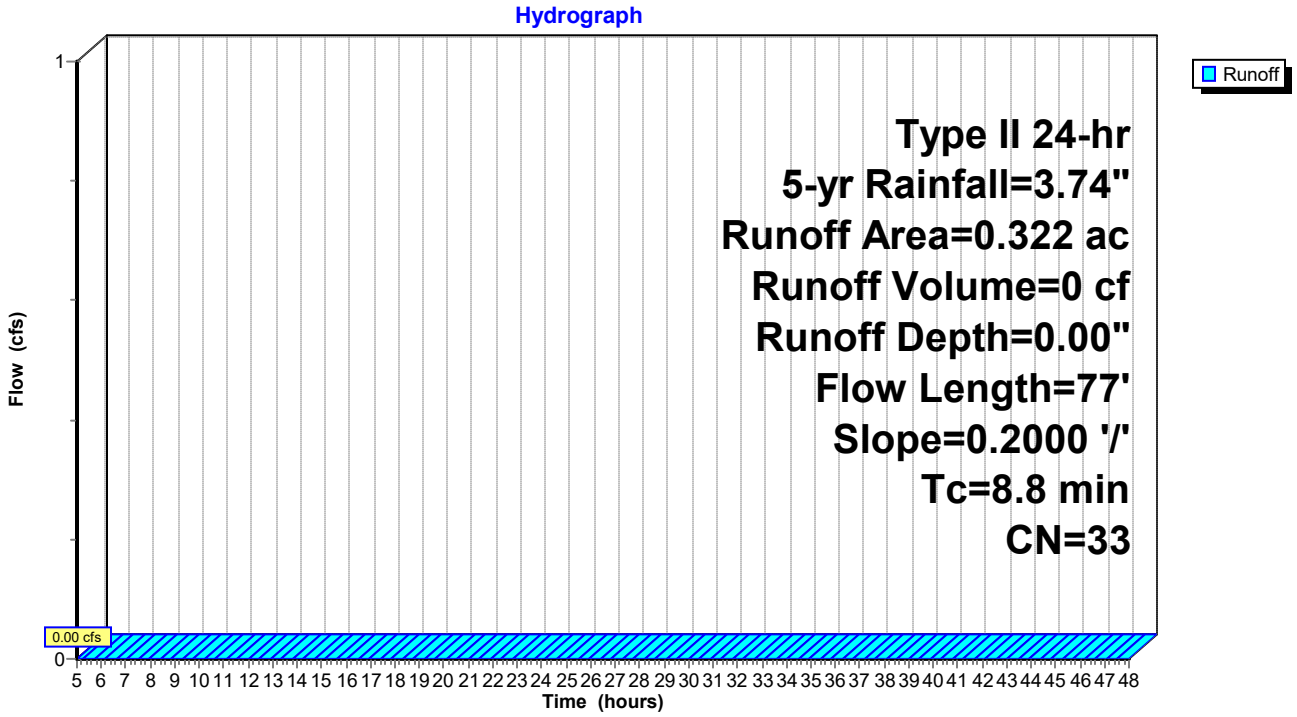
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-yr Rainfall=3.74"

Area (ac)	CN	Description
0.143	36	Woods, Fair, HSG A
0.179	30	Meadow, non-grazed, HSG A
0.322	33	Weighted Average
0.322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	40	0.2000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.03"
6.9	37	0.2000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
8.8	77	Total			

Subcatchment 8S: DA-4



Hydrograph for Subcatchment 8S: DA-4

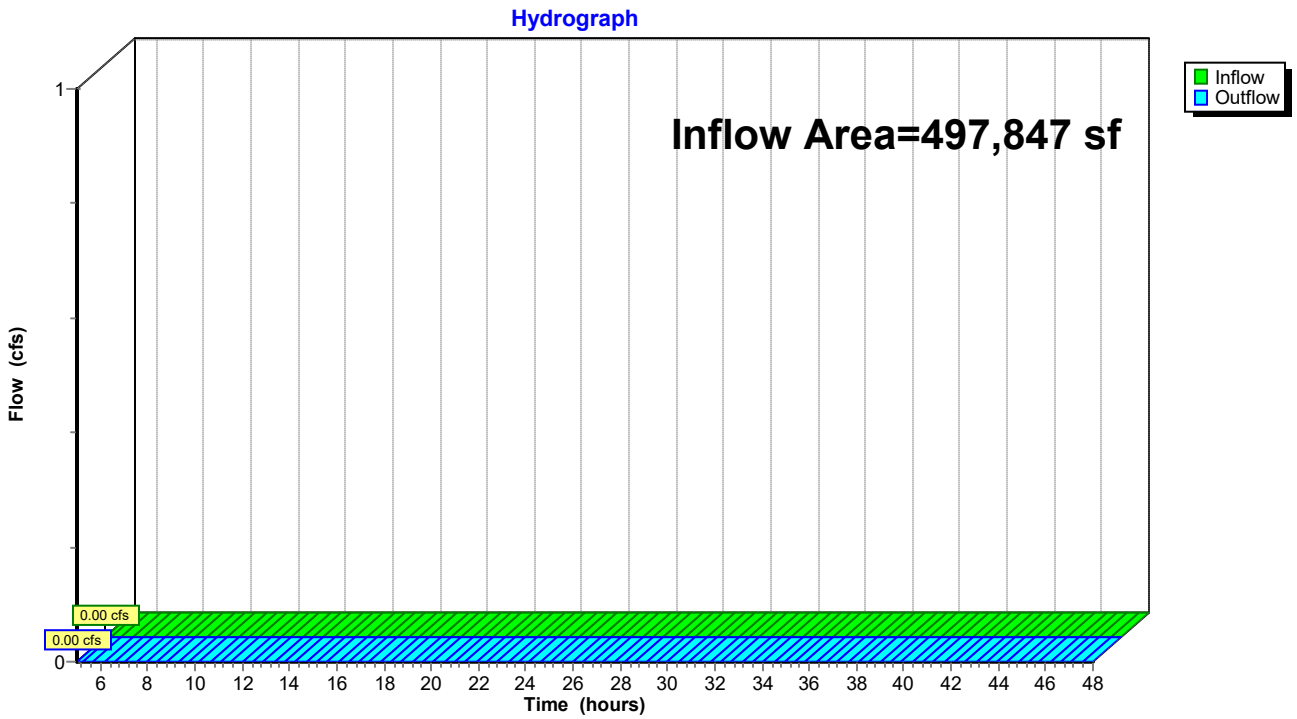
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.24	**0.00**	**0.00**	30.50	3.74	0.00	0.00
5.50	0.27	0.00	0.00	31.00	3.74	0.00	0.00
6.00	0.30	0.00	0.00	31.50	3.74	0.00	0.00
6.50	0.33	0.00	0.00	32.00	3.74	0.00	0.00
7.00	0.37	0.00	0.00	32.50	3.74	0.00	0.00
7.50	0.41	0.00	0.00	33.00	3.74	0.00	0.00
8.00	0.45	0.00	0.00	33.50	3.74	0.00	0.00
8.50	0.49	0.00	0.00	34.00	3.74	0.00	0.00
9.00	0.55	0.00	0.00	34.50	3.74	0.00	0.00
9.50	0.61	0.00	0.00	35.00	3.74	0.00	0.00
10.00	0.68	0.00	0.00	35.50	3.74	0.00	0.00
10.50	0.76	0.00	0.00	36.00	3.74	0.00	0.00
11.00	0.88	0.00	0.00	36.50	3.74	0.00	0.00
11.50	1.06	0.00	0.00	37.00	3.74	0.00	0.00
12.00	2.48	0.00	0.00	37.50	3.74	0.00	0.00
12.50	2.75	0.00	0.00	38.00	3.74	0.00	0.00
13.00	2.89	0.00	0.00	38.50	3.74	0.00	0.00
13.50	2.99	0.00	0.00	39.00	3.74	0.00	0.00
14.00	3.07	0.00	0.00	39.50	3.74	0.00	0.00
14.50	3.13	0.00	0.00	40.00	3.74	0.00	0.00
15.00	3.19	0.00	0.00	40.50	3.74	0.00	0.00
15.50	3.24	0.00	0.00	41.00	3.74	0.00	0.00
16.00	3.29	0.00	0.00	41.50	3.74	0.00	0.00
16.50	3.33	0.00	0.00	42.00	3.74	0.00	0.00
17.00	3.37	0.00	0.00	42.50	3.74	0.00	0.00
17.50	3.41	0.00	0.00	43.00	3.74	0.00	0.00
18.00	3.44	0.00	0.00	43.50	3.74	0.00	0.00
18.50	3.48	0.00	0.00	44.00	3.74	0.00	0.00
19.00	3.51	0.00	0.00	44.50	3.74	0.00	0.00
19.50	3.54	0.00	0.00	45.00	3.74	0.00	0.00
20.00	3.56	0.00	0.00	45.50	3.74	0.00	0.00
20.50	3.58	0.00	0.00	46.00	3.74	0.00	0.00
21.00	3.61	0.00	0.00	46.50	3.74	0.00	0.00
21.50	3.63	0.00	0.00	47.00	3.74	0.00	0.00
22.00	3.65	0.00	0.00	47.50	3.74	0.00	0.00
22.50	3.68	0.00	0.00	48.00	3.74	0.00	0.00
23.00	3.70	0.00	0.00				
23.50	3.72	0.00	0.00				
24.00	**3.74**	0.00	0.00				
24.50	3.74	0.00	0.00				
25.00	3.74	0.00	0.00				
25.50	3.74	0.00	0.00				
26.00	3.74	0.00	0.00				
26.50	3.74	0.00	0.00				
27.00	3.74	0.00	0.00				
27.50	3.74	0.00	0.00				
28.00	3.74	0.00	0.00				
28.50	3.74	0.00	0.00				
29.00	3.74	0.00	0.00				
29.50	3.74	0.00	0.00				
30.00	3.74	0.00	0.00				

Summary for Reach 10R: Post w/BMP

Inflow Area = 497,847 sf, 0.00% Impervious, Inflow Depth = 0.00" for 5-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/BMP



Hydrograph for Reach 10R: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	**0.00**		**0.00**	30.50	0.00		0.00
5.50	0.00		0.00	31.00	0.00		0.00
6.00	0.00		0.00	31.50	0.00		0.00
6.50	0.00		0.00	32.00	0.00		0.00
7.00	0.00		0.00	32.50	0.00		0.00
7.50	0.00		0.00	33.00	0.00		0.00
8.00	0.00		0.00	33.50	0.00		0.00
8.50	0.00		0.00	34.00	0.00		0.00
9.00	0.00		0.00	34.50	0.00		0.00
9.50	0.00		0.00	35.00	0.00		0.00
10.00	0.00		0.00	35.50	0.00		0.00
10.50	0.00		0.00	36.00	0.00		0.00
11.00	0.00		0.00	36.50	0.00		0.00
11.50	0.00		0.00	37.00	0.00		0.00
12.00	0.00		0.00	37.50	0.00		0.00
12.50	0.00		0.00	38.00	0.00		0.00
13.00	0.00		0.00	38.50	0.00		0.00
13.50	0.00		0.00	39.00	0.00		0.00
14.00	0.00		0.00	39.50	0.00		0.00
14.50	0.00		0.00	40.00	0.00		0.00
15.00	0.00		0.00	40.50	0.00		0.00
15.50	0.00		0.00	41.00	0.00		0.00
16.00	0.00		0.00	41.50	0.00		0.00
16.50	0.00		0.00	42.00	0.00		0.00
17.00	0.00		0.00	42.50	0.00		0.00
17.50	0.00		0.00	43.00	0.00		0.00
18.00	0.00		0.00	43.50	0.00		0.00
18.50	0.00		0.00	44.00	0.00		0.00
19.00	0.00		0.00	44.50	0.00		0.00
19.50	0.00		0.00	45.00	0.00		0.00
20.00	0.00		0.00	45.50	0.00		0.00
20.50	0.00		0.00	46.00	0.00		0.00
21.00	0.00		0.00	46.50	0.00		0.00
21.50	0.00		0.00	47.00	0.00		0.00
22.00	0.00		0.00	47.50	0.00		0.00
22.50	0.00		0.00	48.00	0.00		0.00
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				

Summary for Pond 6P: Wet Pond

Inflow Area = 222,940 sf, 0.00% Impervious, Inflow Depth = 0.01" for 5-yr event
Inflow = 0.01 cfs @ 24.04 hrs, Volume= 252 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,242.61' @ 25.70 hrs Surf.Area= 2,367 sf Storage= 251 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

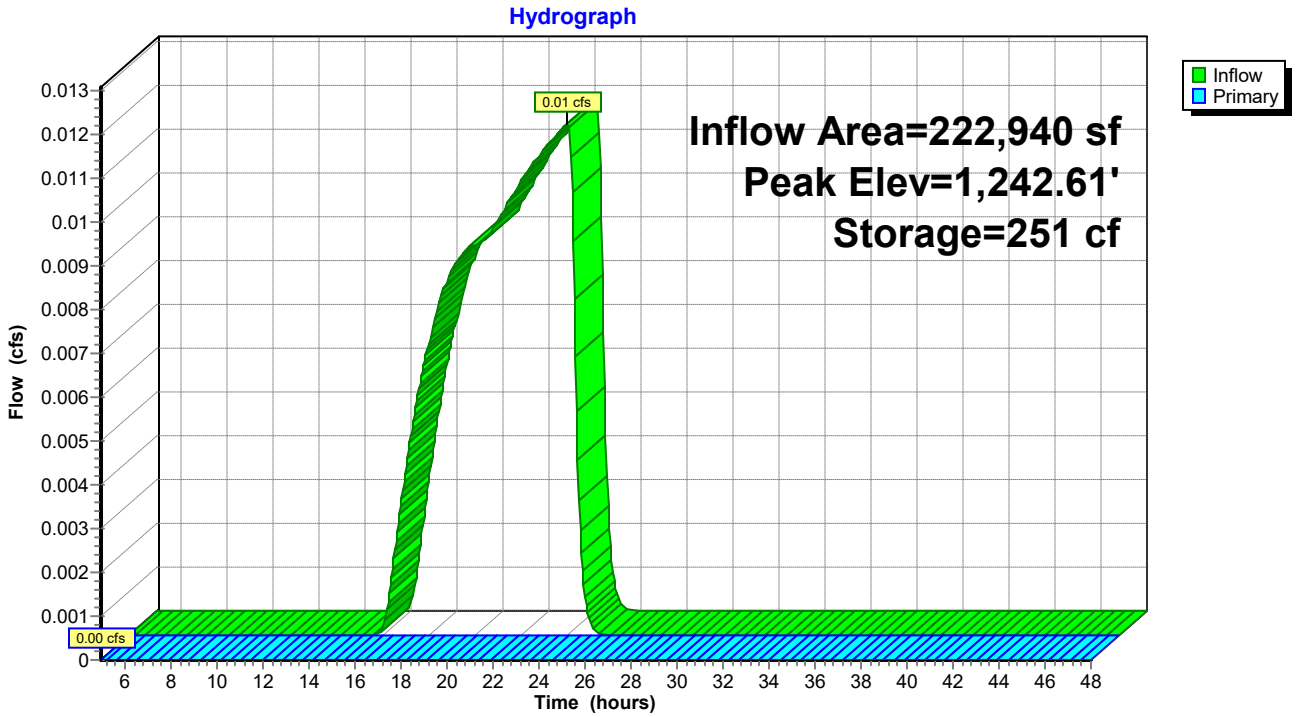
Volume	Invert	Avail.Storage	Storage Description
#1	1,242.50'	48,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,242.50	2,285	0	0
1,244.00	3,425	4,283	4,283
1,246.00	5,081	8,506	12,789
1,248.00	6,932	12,013	24,802
1,250.00	8,031	14,963	39,765
1,251.00	10,320	9,176	48,940

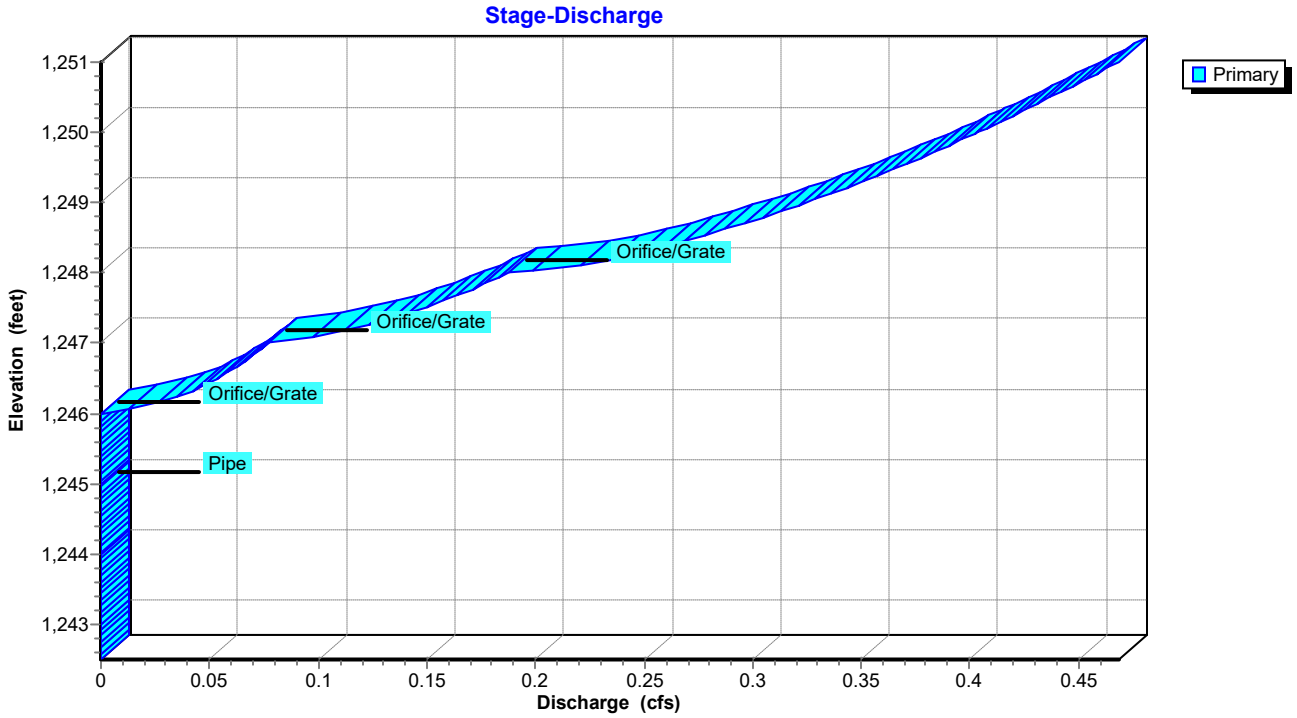
Device	Routing	Invert	Outlet Devices
#1	Primary	1,245.00'	**15.0" Round Pipe** L= 100.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,245.00' / 1,243.00' S= 0.0200 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	1,246.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	1,247.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,248.00'	**1.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,242.50' (Free Discharge)
└─**1=Pipe** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Wet Pond



Pond 6P: Wet Pond



Hydrograph for Pond 6P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	1,242.50	**0.00**
6.00	0.00	0	1,242.50	0.00
7.00	0.00	0	1,242.50	0.00
8.00	0.00	0	1,242.50	0.00
9.00	0.00	0	1,242.50	0.00
10.00	0.00	0	1,242.50	0.00
11.00	0.00	0	1,242.50	0.00
12.00	0.00	0	1,242.50	0.00
13.00	0.00	0	1,242.50	0.00
14.00	0.00	0	1,242.50	0.00
15.00	0.00	0	1,242.50	0.00
16.00	0.00	0	1,242.50	0.00
17.00	0.00	6	1,242.50	0.00
18.00	0.01	25	1,242.51	0.00
19.00	0.01	53	1,242.52	0.00
20.00	0.01	84	1,242.54	0.00
21.00	0.01	117	1,242.55	0.00
22.00	0.01	153	1,242.57	0.00
23.00	0.01	191	1,242.58	0.00
24.00	**0.01**	232	1,242.60	0.00
25.00	**0.00**	**251**	**1,242.61**	0.00
26.00	0.00	**252**	**1,242.61**	0.00
27.00	0.00	252	1,242.61	0.00
28.00	0.00	252	1,242.61	0.00
29.00	0.00	252	1,242.61	0.00
30.00	0.00	252	1,242.61	0.00
31.00	0.00	252	1,242.61	0.00
32.00	0.00	252	1,242.61	0.00
33.00	0.00	252	1,242.61	0.00
34.00	0.00	252	1,242.61	0.00
35.00	0.00	252	1,242.61	0.00
36.00	0.00	252	1,242.61	0.00
37.00	0.00	252	1,242.61	0.00
38.00	0.00	252	1,242.61	0.00
39.00	0.00	252	1,242.61	0.00
40.00	0.00	252	1,242.61	0.00
41.00	0.00	252	1,242.61	0.00
42.00	0.00	252	1,242.61	0.00
43.00	0.00	252	1,242.61	0.00
44.00	0.00	252	1,242.61	0.00
45.00	0.00	252	1,242.61	0.00
46.00	0.00	252	1,242.61	0.00
47.00	0.00	252	1,242.61	0.00
48.00	0.00	252	1,242.61	0.00

Stage-Discharge for Pond 6P: Wet Pond

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,242.50	0.00	1,247.60	0.16
1,242.60	0.00	1,247.70	0.17
1,242.70	0.00	1,247.80	0.17
1,242.80	0.00	1,247.90	0.18
1,242.90	0.00	1,248.00	0.19
1,243.00	0.00	1,248.10	0.22
1,243.10	0.00	1,248.20	0.24
1,243.20	0.00	1,248.30	0.25
1,243.30	0.00	1,248.40	0.26
1,243.40	0.00	1,248.50	0.27
1,243.50	0.00	1,248.60	0.29
1,243.60	0.00	1,248.70	0.30
1,243.70	0.00	1,248.80	0.31
1,243.80	0.00	1,248.90	0.32
1,243.90	0.00	1,249.00	0.32
1,244.00	0.00	1,249.10	0.33
1,244.10	0.00	1,249.20	0.34
1,244.20	0.00	1,249.30	0.35
1,244.30	0.00	1,249.40	0.36
1,244.40	0.00	1,249.50	0.37
1,244.50	0.00	1,249.60	0.37
1,244.60	0.00	1,249.70	0.38
1,244.70	0.00	1,249.80	0.39
1,244.80	0.00	1,249.90	0.40
1,244.90	0.00	1,250.00	0.40
1,245.00	0.00	1,250.10	0.41
1,245.10	0.00	1,250.20	0.42
1,245.20	0.00	1,250.30	0.42
1,245.30	0.00	1,250.40	0.43
1,245.40	0.00	1,250.50	0.44
1,245.50	0.00	1,250.60	0.44
1,245.60	0.00	1,250.70	0.45
1,245.70	0.00	1,250.80	0.46
1,245.80	0.00	1,250.90	0.46
1,245.90	0.00	1,251.00	**0.47**
1,246.00	0.00		
1,246.10	0.02		
1,246.20	0.03		
1,246.30	0.04		
1,246.40	0.05		
1,246.50	0.05		
1,246.60	0.06		
1,246.70	0.06		
1,246.80	0.07		
1,246.90	0.07		
1,247.00	0.08		
1,247.10	0.10		
1,247.20	0.12		
1,247.30	0.13		
1,247.40	0.14		
1,247.50	0.15		

Stage-Area-Storage for Pond 6P: Wet Pond

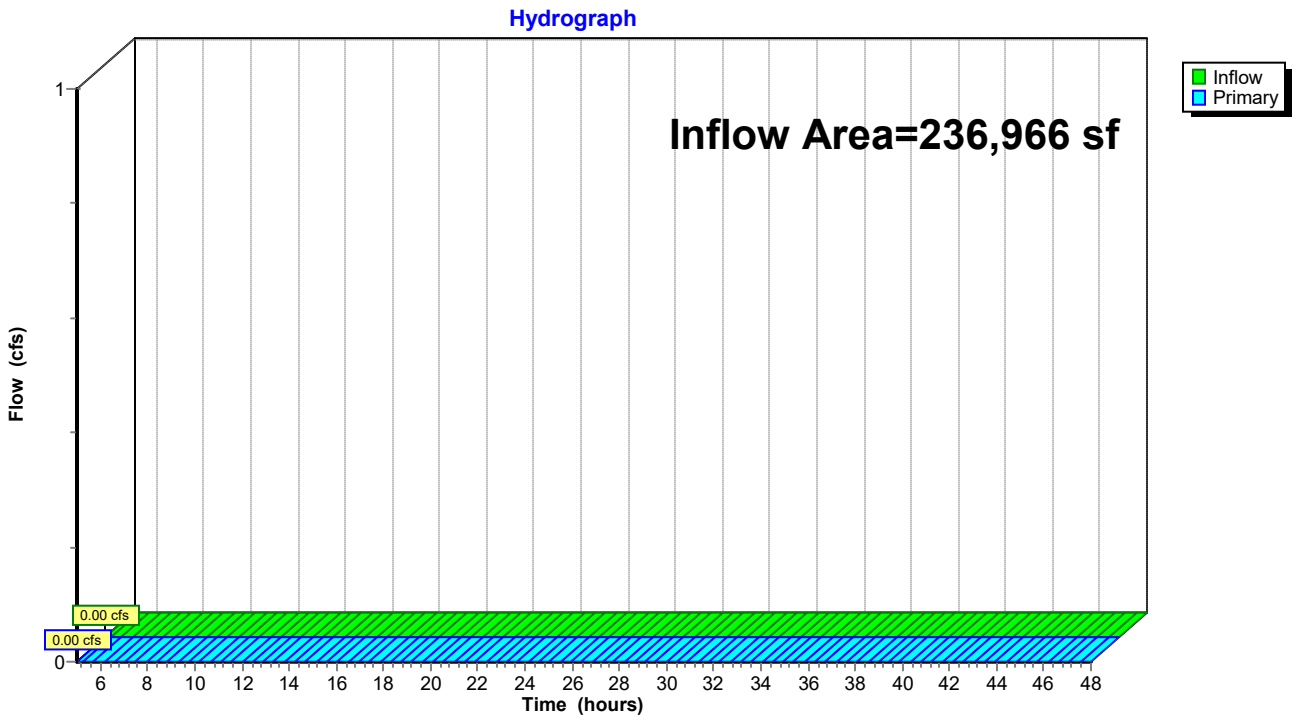
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,242.50	2,285	0
1,242.60	2,361	232
1,242.70	2,437	472
1,242.80	2,513	720
1,242.90	2,589	975
1,243.00	2,665	1,238
1,243.10	2,741	1,508
1,243.20	2,817	1,786
1,243.30	2,893	2,071
1,243.40	2,969	2,364
1,243.50	3,045	2,665
1,243.60	3,121	2,973
1,243.70	3,197	3,289
1,243.80	3,273	3,613
1,243.90	3,349	3,944
1,244.00	3,425	4,283
1,244.10	3,508	4,629
1,244.20	3,591	4,984
1,244.30	3,673	5,347
1,244.40	3,756	5,719
1,244.50	3,839	6,099
1,244.60	3,922	6,487
1,244.70	4,005	6,883
1,244.80	4,087	7,287
1,244.90	4,170	7,700
1,245.00	4,253	8,122
1,245.10	4,336	8,551
1,245.20	4,419	8,989
1,245.30	4,501	9,435
1,245.40	4,584	9,889
1,245.50	4,667	10,352
1,245.60	4,750	10,822
1,245.70	4,833	11,301
1,245.80	4,915	11,789
1,245.90	4,998	12,285
1,246.00	5,081	12,789
1,246.10	5,174	13,301
1,246.20	5,266	13,823
1,246.30	5,359	14,354
1,246.40	5,451	14,895
1,246.50	5,544	15,445
1,246.60	5,636	16,004
1,246.70	5,729	16,572
1,246.80	5,821	17,149
1,246.90	5,914	17,736
1,247.00	6,007	18,332
1,247.10	6,099	18,938
1,247.20	6,192	19,552
1,247.30	6,284	20,176
1,247.40	6,377	20,809
1,247.50	6,469	21,451
1,247.60	6,562	22,103
1,247.70	6,654	22,764
1,247.80	6,747	23,434
1,247.90	6,839	24,113
1,248.00	6,932	24,802
1,248.10	6,987	25,497
1,248.20	7,042	26,199
1,248.30	7,097	26,906
1,248.40	7,152	27,618
1,248.50	7,207	28,336
1,248.60	7,262	29,060
1,248.70	7,317	29,789
1,248.80	7,372	30,523
1,248.90	7,427	31,263
1,249.00	7,482	32,008
1,249.10	7,536	32,759
1,249.20	7,591	33,516
1,249.30	7,646	34,277
1,249.40	7,701	35,045
1,249.50	7,756	35,818
1,249.60	7,811	36,596
1,249.70	7,866	37,380
1,249.80	7,921	38,169
1,249.90	7,976	38,964
1,250.00	8,031	39,765
1,250.10	8,260	40,579
1,250.20	8,489	41,416
1,250.30	8,718	42,277
1,250.40	8,947	43,160
1,250.50	9,176	44,066
1,250.60	9,404	44,995
1,250.70	9,633	45,947
1,250.80	9,862	46,922
1,250.90	10,091	47,919
1,251.00	**10,320**	**48,940**

Summary for Link 5L:

Inflow Area = 236,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 5-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Link 5L:



Hydrograph for Link 5L:

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	**0.00**	**0.00**	**0.00**	30.50	0.00	0.00	0.00
5.50	0.00	0.00	0.00	31.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	31.50	0.00	0.00	0.00
6.50	0.00	0.00	0.00	32.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	32.50	0.00	0.00	0.00
7.50	0.00	0.00	0.00	33.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	33.50	0.00	0.00	0.00
8.50	0.00	0.00	0.00	34.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	34.50	0.00	0.00	0.00
9.50	0.00	0.00	0.00	35.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	35.50	0.00	0.00	0.00
10.50	0.00	0.00	0.00	36.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	36.50	0.00	0.00	0.00
11.50	0.00	0.00	0.00	37.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	37.50	0.00	0.00	0.00
12.50	0.00	0.00	0.00	38.00	0.00	0.00	0.00
13.00	0.00	0.00	0.00	38.50	0.00	0.00	0.00
13.50	0.00	0.00	0.00	39.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	39.50	0.00	0.00	0.00
14.50	0.00	0.00	0.00	40.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	40.50	0.00	0.00	0.00
15.50	0.00	0.00	0.00	41.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	41.50	0.00	0.00	0.00
16.50	0.00	0.00	0.00	42.00	0.00	0.00	0.00
17.00	0.00	0.00	0.00	42.50	0.00	0.00	0.00
17.50	0.00	0.00	0.00	43.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00	43.50	0.00	0.00	0.00
18.50	0.00	0.00	0.00	44.00	0.00	0.00	0.00
19.00	0.00	0.00	0.00	44.50	0.00	0.00	0.00
19.50	0.00	0.00	0.00	45.00	0.00	0.00	0.00
20.00	0.00	0.00	0.00	45.50	0.00	0.00	0.00
20.50	0.00	0.00	0.00	46.00	0.00	0.00	0.00
21.00	0.00	0.00	0.00	46.50	0.00	0.00	0.00
21.50	0.00	0.00	0.00	47.00	0.00	0.00	0.00
22.00	0.00	0.00	0.00	47.50	0.00	0.00	0.00
22.50	0.00	0.00	0.00	48.00	0.00	0.00	0.00
23.00	0.00	0.00	0.00				
23.50	0.00	0.00	0.00				
24.00	0.00	0.00	0.00				
24.50	0.00	0.00	0.00				
25.00	0.00	0.00	0.00				
25.50	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
26.50	0.00	0.00	0.00				
27.00	0.00	0.00	0.00				
27.50	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
28.50	0.00	0.00	0.00				
29.00	0.00	0.00	0.00				
29.50	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.442 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=561' Tc=19.7 min CN=33 Runoff=0.00 cfs 21 cf

Subcatchment 6S: DA-2 Runoff Area=5.118 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=868' Tc=29.6 min CN=38 Runoff=0.04 cfs 1,261 cf

Subcatchment 7S: DA-3 Runoff Area=4.547 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=822' Tc=41.1 min CN=34 Runoff=0.01 cfs 182 cf

Subcatchment 8S: DA-4 Runoff Area=0.322 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=77' Slope=0.2000 '/' Tc=8.8 min CN=33 Runoff=0.00 cfs 5 cf

Reach 10R: Post w/BMP Inflow=0.01 cfs 208 cf
Outflow=0.01 cfs 208 cf

Pond 6P: Wet Pond Peak Elev=1,243.01' Storage=1,261 cf Inflow=0.04 cfs 1,261 cf
Outflow=0.00 cfs 0 cf

Link 5L: Inflow=0.00 cfs 5 cf
Primary=0.00 cfs 5 cf

Total Runoff Area = 497,847 sf Runoff Volume = 1,469 cf Average Runoff Depth = 0.04"
100.00% Pervious = 497,847 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

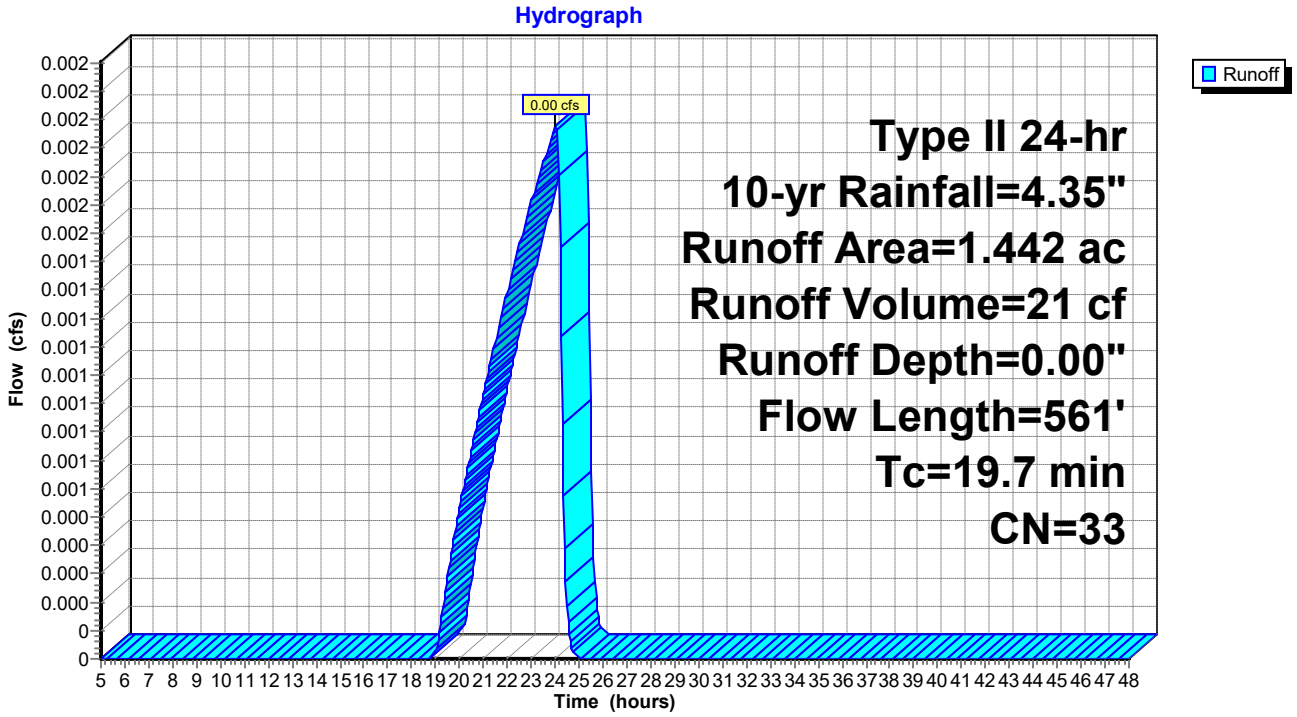
Runoff = 0.00 cfs @ 24.03 hrs, Volume= 21 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.35"

Area (ac)	CN	Description
0.707	36	Woods, Fair, HSG A
0.735	30	Meadow, non-grazed, HSG A
1.442	33	Weighted Average
1.442		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	76	0.1050	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.8	485	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	561	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	0.00
12.00	2.88	0.00	0.00
12.50	3.20	0.00	0.00
13.00	3.36	0.00	0.00
13.50	3.48	0.00	0.00
14.00	3.57	0.00	0.00
14.50	3.64	0.00	0.00
15.00	3.71	0.00	0.00
15.50	3.77	0.00	0.00
16.00	3.83	0.00	0.00
16.50	3.88	0.00	0.00
17.00	3.92	0.00	0.00
17.50	3.97	0.00	0.00
18.00	4.01	0.00	0.00
18.50	4.04	0.00	0.00
19.00	4.08	0.00	0.00
19.50	4.11	0.00	0.00
20.00	4.14	0.00	0.00
20.50	4.17	0.00	0.00
21.00	4.20	0.00	0.00
21.50	4.22	0.00	0.00
22.00	4.25	0.00	0.00
22.50	4.28	0.00	0.00
23.00	4.30	0.00	0.00
23.50	4.33	0.00	0.00
24.00	**4.35**	**0.00**	**0.00**
24.50	4.35	0.00	**0.00**
25.00	4.35	0.00	0.00
25.50	4.35	0.00	0.00
26.00	4.35	0.00	0.00
26.50	4.35	0.00	0.00
27.00	4.35	0.00	0.00
27.50	4.35	0.00	0.00
28.00	4.35	0.00	0.00
28.50	4.35	0.00	0.00
29.00	4.35	0.00	0.00
29.50	4.35	0.00	0.00
30.00	4.35	0.00	0.00
30.50	4.35	0.00	0.00
31.00	4.35	0.00	0.00
31.50	4.35	0.00	0.00
32.00	4.35	0.00	0.00
32.50	4.35	0.00	0.00
33.00	4.35	0.00	0.00
33.50	4.35	0.00	0.00
34.00	4.35	0.00	0.00
34.50	4.35	0.00	0.00
35.00	4.35	0.00	0.00
35.50	4.35	0.00	0.00
36.00	4.35	0.00	0.00
36.50	4.35	0.00	0.00
37.00	4.35	0.00	0.00
37.50	4.35	0.00	0.00
38.00	4.35	0.00	0.00
38.50	4.35	0.00	0.00
39.00	4.35	0.00	0.00
39.50	4.35	0.00	0.00
40.00	4.35	0.00	0.00
40.50	4.35	0.00	0.00
41.00	4.35	0.00	0.00
41.50	4.35	0.00	0.00
42.00	4.35	0.00	0.00
42.50	4.35	0.00	0.00
43.00	4.35	0.00	0.00
43.50	4.35	0.00	0.00
44.00	4.35	0.00	0.00
44.50	4.35	0.00	0.00
45.00	4.35	0.00	0.00
45.50	4.35	0.00	0.00
46.00	4.35	0.00	0.00
46.50	4.35	0.00	0.00
47.00	4.35	0.00	0.00
47.50	4.35	0.00	0.00
48.00	4.35	0.00	0.00

Summary for Subcatchment 6S: DA-2

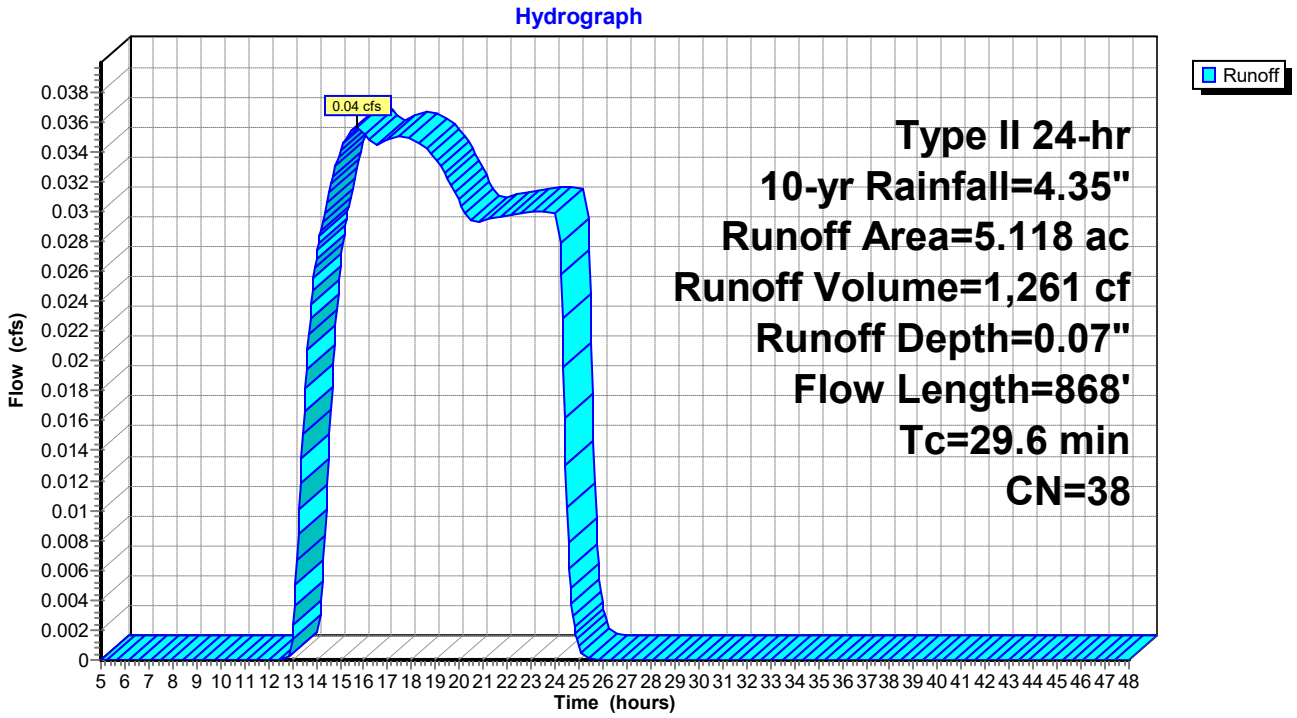
Runoff = 0.04 cfs @ 15.71 hrs, Volume= 1,261 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.35"

	Area (ac)	CN	Description
	3.101	36	Woods, Fair, HSG A
	1.615	30	Meadow, non-grazed, HSG A
*	0.402	89	Gravel area
	5.118	38	Weighted Average
	5.118		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3	80	0.0500	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.5	262	0.0610	1.23		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	122	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	56	0.1070	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	232	0.0520	3.81	6.86	**Channel Flow, Diversion Channel** Area= 1.8 sf Perim= 5.0' r= 0.36' n= 0.045
2.1	116	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.6	868	Total			

Subcatchment 6S: DA-2



Hydrograph for Subcatchment 6S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	0.00
12.00	2.88	0.00	0.00
12.50	3.20	0.00	0.00
13.00	3.36	0.00	0.00
13.50	3.48	0.00	0.02
14.00	3.57	0.01	0.03
14.50	3.64	0.01	0.03
15.00	3.71	0.01	0.03
15.50	3.77	0.02	**0.04**
16.00	3.83	0.02	**0.04**
16.50	3.88	0.02	0.03
17.00	3.92	0.03	0.03
17.50	3.97	0.03	0.04
18.00	4.01	0.03	0.03
18.50	4.04	0.04	0.03
19.00	4.08	0.04	0.03
19.50	4.11	0.04	0.03
20.00	4.14	0.04	0.03
20.50	4.17	0.05	0.03
21.00	4.20	0.05	0.03
21.50	4.22	0.05	0.03
22.00	4.25	0.06	0.03
22.50	4.28	0.06	0.03
23.00	4.30	0.06	0.03
23.50	4.33	0.06	0.03
24.00	**4.35**	**0.07**	0.03
24.50	4.35	0.07	0.01
25.00	4.35	0.07	0.00
25.50	4.35	0.07	0.00
26.00	4.35	0.07	0.00
26.50	4.35	0.07	0.00
27.00	4.35	0.07	0.00
27.50	4.35	0.07	0.00
28.00	4.35	0.07	0.00
28.50	4.35	0.07	0.00
29.00	4.35	0.07	0.00
29.50	4.35	0.07	0.00
30.00	4.35	0.07	0.00
30.50	4.35	0.07	0.00
31.00	4.35	0.07	0.00
31.50	4.35	0.07	0.00
32.00	4.35	0.07	0.00
32.50	4.35	0.07	0.00
33.00	4.35	0.07	0.00
33.50	4.35	0.07	0.00
34.00	4.35	0.07	0.00
34.50	4.35	0.07	0.00
35.00	4.35	0.07	0.00
35.50	4.35	0.07	0.00
36.00	4.35	0.07	0.00
36.50	4.35	0.07	0.00
37.00	4.35	0.07	0.00
37.50	4.35	0.07	0.00
38.00	4.35	0.07	0.00
38.50	4.35	0.07	0.00
39.00	4.35	0.07	0.00
39.50	4.35	0.07	0.00
40.00	4.35	0.07	0.00
40.50	4.35	0.07	0.00
41.00	4.35	0.07	0.00
41.50	4.35	0.07	0.00
42.00	4.35	0.07	0.00
42.50	4.35	0.07	0.00
43.00	4.35	0.07	0.00
43.50	4.35	0.07	0.00
44.00	4.35	0.07	0.00
44.50	4.35	0.07	0.00
45.00	4.35	0.07	0.00
45.50	4.35	0.07	0.00
46.00	4.35	0.07	0.00
46.50	4.35	0.07	0.00
47.00	4.35	0.07	0.00
47.50	4.35	0.07	0.00
48.00	4.35	0.07	0.00

Summary for Subcatchment 7S: DA-3

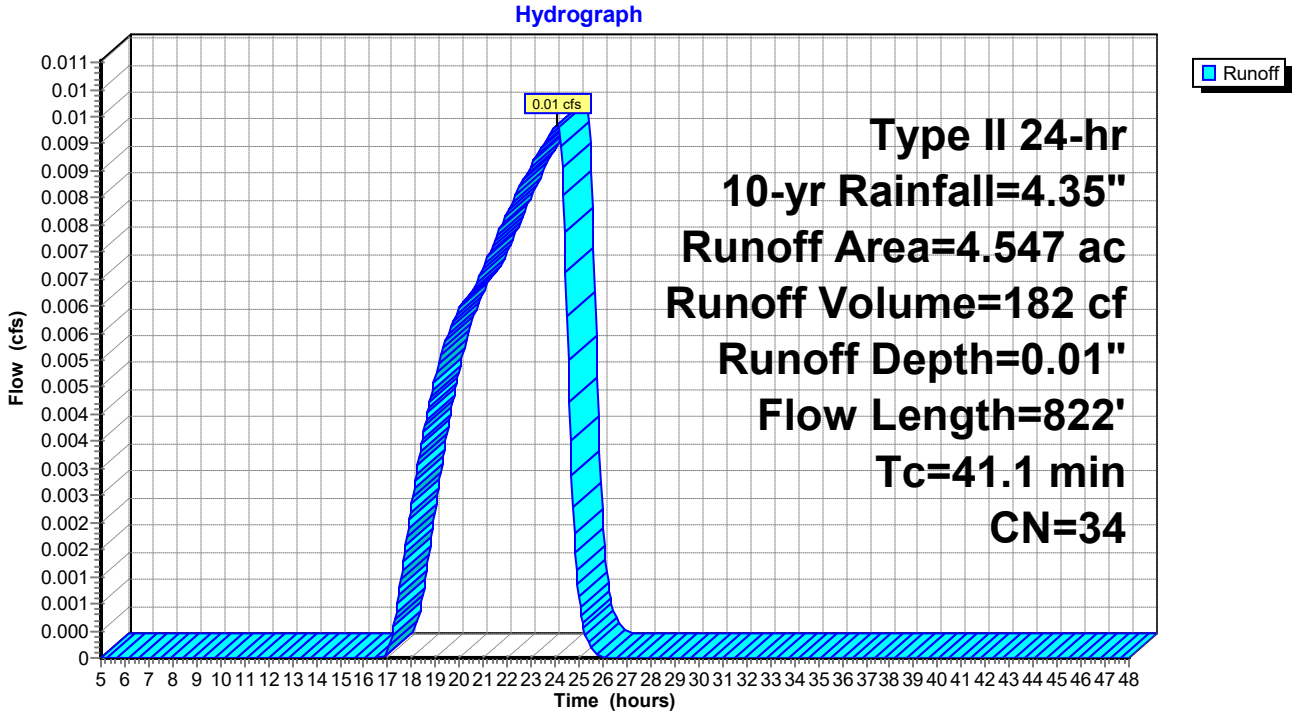
Runoff = 0.01 cfs @ 24.08 hrs, Volume= 182 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.35"

Area (ac)	CN	Description
3.255	36	Woods, Fair, HSG A
1.292	30	Meadow, non-grazed, HSG A
4.547	34	Weighted Average
4.547		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.6	98	0.0250	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
5.8	592	0.1140	1.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	132	0.1780	2.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
41.1	822	Total			

Subcatchment 7S: DA-3



Hydrograph for Subcatchment 7S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	0.00
12.00	2.88	0.00	0.00
12.50	3.20	0.00	0.00
13.00	3.36	0.00	0.00
13.50	3.48	0.00	0.00
14.00	3.57	0.00	0.00
14.50	3.64	0.00	0.00
15.00	3.71	0.00	0.00
15.50	3.77	0.00	0.00
16.00	3.83	0.00	0.00
16.50	3.88	0.00	0.00
17.00	3.92	0.00	0.00
17.50	3.97	0.00	0.00
18.00	4.01	0.00	0.00
18.50	4.04	0.00	0.00
19.00	4.08	0.00	0.01
19.50	4.11	0.00	0.01
20.00	4.14	0.00	0.01
20.50	4.17	0.00	0.01
21.00	4.20	0.01	0.01
21.50	4.22	0.01	0.01
22.00	4.25	0.01	0.01
22.50	4.28	0.01	0.01
23.00	4.30	0.01	0.01
23.50	4.33	0.01	0.01
24.00	**4.35**	**0.01**	**0.01**
24.50	4.35	0.01	**0.01**
25.00	4.35	0.01	0.00
25.50	4.35	0.01	0.00
26.00	4.35	0.01	0.00
26.50	4.35	0.01	0.00
27.00	4.35	0.01	0.00
27.50	4.35	0.01	0.00
28.00	4.35	0.01	0.00
28.50	4.35	0.01	0.00
29.00	4.35	0.01	0.00
29.50	4.35	0.01	0.00
30.00	4.35	0.01	0.00
30.50	4.35	0.01	0.00
31.00	4.35	0.01	0.00
31.50	4.35	0.01	0.00
32.00	4.35	0.01	0.00
32.50	4.35	0.01	0.00
33.00	4.35	0.01	0.00
33.50	4.35	0.01	0.00
34.00	4.35	0.01	0.00
34.50	4.35	0.01	0.00
35.00	4.35	0.01	0.00
35.50	4.35	0.01	0.00
36.00	4.35	0.01	0.00
36.50	4.35	0.01	0.00
37.00	4.35	0.01	0.00
37.50	4.35	0.01	0.00
38.00	4.35	0.01	0.00
38.50	4.35	0.01	0.00
39.00	4.35	0.01	0.00
39.50	4.35	0.01	0.00
40.00	4.35	0.01	0.00
40.50	4.35	0.01	0.00
41.00	4.35	0.01	0.00
41.50	4.35	0.01	0.00
42.00	4.35	0.01	0.00
42.50	4.35	0.01	0.00
43.00	4.35	0.01	0.00
43.50	4.35	0.01	0.00
44.00	4.35	0.01	0.00
44.50	4.35	0.01	0.00
45.00	4.35	0.01	0.00
45.50	4.35	0.01	0.00
46.00	4.35	0.01	0.00
46.50	4.35	0.01	0.00
47.00	4.35	0.01	0.00
47.50	4.35	0.01	0.00
48.00	4.35	0.01	0.00

Summary for Subcatchment 8S: DA-4

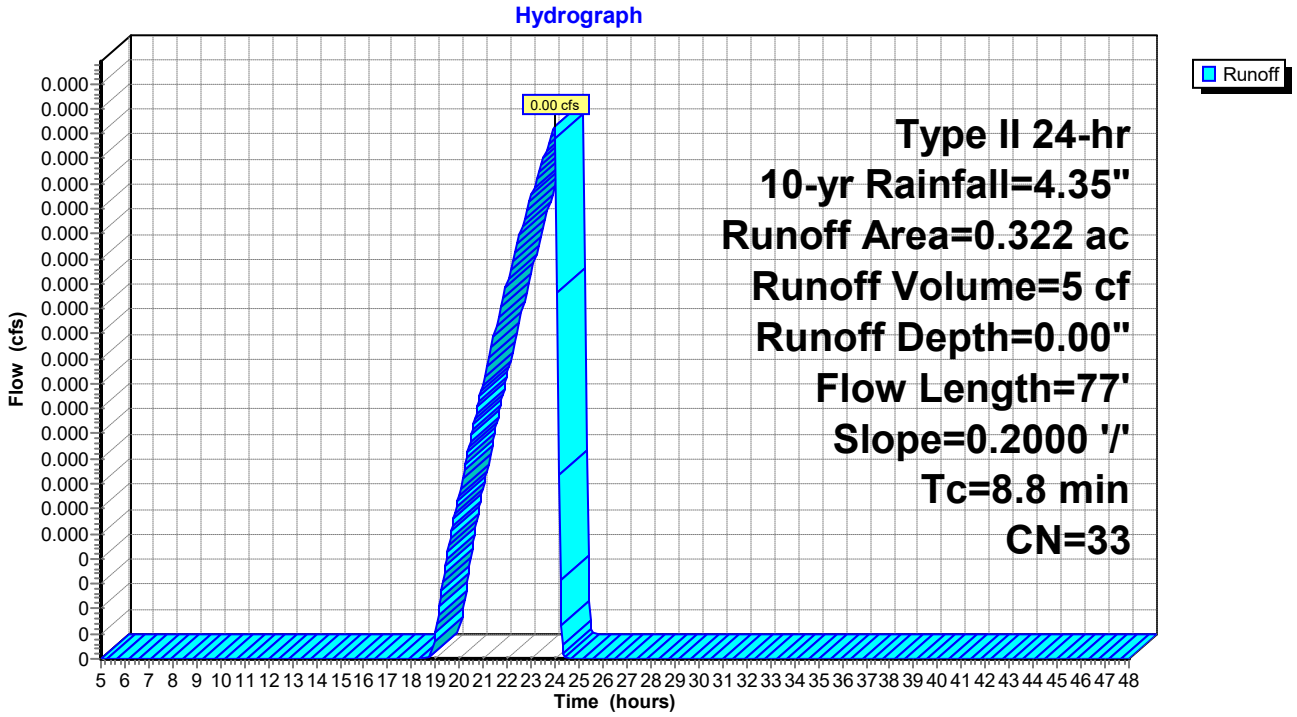
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 5 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.35"

Area (ac)	CN	Description
0.143	36	Woods, Fair, HSG A
0.179	30	Meadow, non-grazed, HSG A
0.322	33	Weighted Average
0.322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	40	0.2000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.03"
6.9	37	0.2000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
8.8	77	Total			

Subcatchment 8S: DA-4



Hydrograph for Subcatchment 8S: DA-4

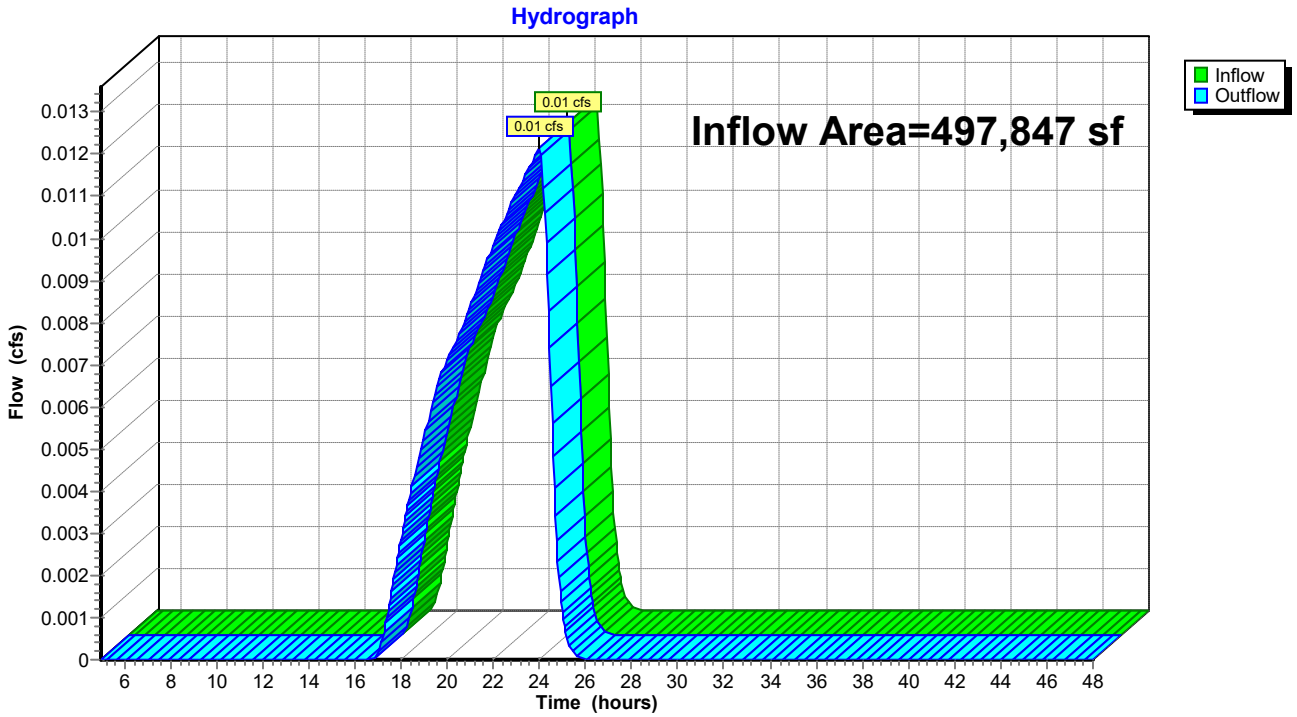
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.50	0.31	0.00	0.00
6.00	0.35	0.00	0.00
6.50	0.39	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.52	0.00	0.00
8.50	0.58	0.00	0.00
9.00	0.64	0.00	0.00
9.50	0.71	0.00	0.00
10.00	0.79	0.00	0.00
10.50	0.89	0.00	0.00
11.00	1.02	0.00	0.00
11.50	1.23	0.00	0.00
12.00	2.88	0.00	0.00
12.50	3.20	0.00	0.00
13.00	3.36	0.00	0.00
13.50	3.48	0.00	0.00
14.00	3.57	0.00	0.00
14.50	3.64	0.00	0.00
15.00	3.71	0.00	0.00
15.50	3.77	0.00	0.00
16.00	3.83	0.00	0.00
16.50	3.88	0.00	0.00
17.00	3.92	0.00	0.00
17.50	3.97	0.00	0.00
18.00	4.01	0.00	0.00
18.50	4.04	0.00	0.00
19.00	4.08	0.00	0.00
19.50	4.11	0.00	0.00
20.00	4.14	0.00	0.00
20.50	4.17	0.00	0.00
21.00	4.20	0.00	0.00
21.50	4.22	0.00	0.00
22.00	4.25	0.00	0.00
22.50	4.28	0.00	0.00
23.00	4.30	0.00	0.00
23.50	4.33	0.00	0.00
24.00	**4.35**	**0.00**	**0.00**
24.50	4.35	0.00	0.00
25.00	4.35	0.00	0.00
25.50	4.35	0.00	0.00
26.00	4.35	0.00	0.00
26.50	4.35	0.00	0.00
27.00	4.35	0.00	0.00
27.50	4.35	0.00	0.00
28.00	4.35	0.00	0.00
28.50	4.35	0.00	0.00
29.00	4.35	0.00	0.00
29.50	4.35	0.00	0.00
30.00	4.35	0.00	0.00
30.50	4.35	0.00	0.00
31.00	4.35	0.00	0.00
31.50	4.35	0.00	0.00
32.00	4.35	0.00	0.00
32.50	4.35	0.00	0.00
33.00	4.35	0.00	0.00
33.50	4.35	0.00	0.00
34.00	4.35	0.00	0.00
34.50	4.35	0.00	0.00
35.00	4.35	0.00	0.00
35.50	4.35	0.00	0.00
36.00	4.35	0.00	0.00
36.50	4.35	0.00	0.00
37.00	4.35	0.00	0.00
37.50	4.35	0.00	0.00
38.00	4.35	0.00	0.00
38.50	4.35	0.00	0.00
39.00	4.35	0.00	0.00
39.50	4.35	0.00	0.00
40.00	4.35	0.00	0.00
40.50	4.35	0.00	0.00
41.00	4.35	0.00	0.00
41.50	4.35	0.00	0.00
42.00	4.35	0.00	0.00
42.50	4.35	0.00	0.00
43.00	4.35	0.00	0.00
43.50	4.35	0.00	0.00
44.00	4.35	0.00	0.00
44.50	4.35	0.00	0.00
45.00	4.35	0.00	0.00
45.50	4.35	0.00	0.00
46.00	4.35	0.00	0.00
46.50	4.35	0.00	0.00
47.00	4.35	0.00	0.00
47.50	4.35	0.00	0.00
48.00	4.35	0.00	0.00

Summary for Reach 10R: Post w/BMP

Inflow Area = 497,847 sf, 0.00% Impervious, Inflow Depth = 0.01" for 10-yr event
Inflow = 0.01 cfs @ 24.03 hrs, Volume= 208 cf
Outflow = 0.01 cfs @ 24.03 hrs, Volume= 208 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/BMP



Hydrograph for Reach 10R: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	30.50	0.00		0.00
5.50	0.00		0.00	31.00	0.00		0.00
6.00	0.00		0.00	31.50	0.00		0.00
6.50	0.00		0.00	32.00	0.00		0.00
7.00	0.00		0.00	32.50	0.00		0.00
7.50	0.00		0.00	33.00	0.00		0.00
8.00	0.00		0.00	33.50	0.00		0.00
8.50	0.00		0.00	34.00	0.00		0.00
9.00	0.00		0.00	34.50	0.00		0.00
9.50	0.00		0.00	35.00	0.00		0.00
10.00	0.00		0.00	35.50	0.00		0.00
10.50	0.00		0.00	36.00	0.00		0.00
11.00	0.00		0.00	36.50	0.00		0.00
11.50	0.00		0.00	37.00	0.00		0.00
12.00	0.00		0.00	37.50	0.00		0.00
12.50	0.00		0.00	38.00	0.00		0.00
13.00	0.00		0.00	38.50	0.00		0.00
13.50	0.00		0.00	39.00	0.00		0.00
14.00	0.00		0.00	39.50	0.00		0.00
14.50	0.00		0.00	40.00	0.00		0.00
15.00	0.00		0.00	40.50	0.00		0.00
15.50	0.00		0.00	41.00	0.00		0.00
16.00	0.00		0.00	41.50	0.00		0.00
16.50	0.00		0.00	42.00	0.00		0.00
17.00	0.00		0.00	42.50	0.00		0.00
17.50	0.00		0.00	43.00	0.00		0.00
18.00	0.00		0.00	43.50	0.00		0.00
18.50	0.00		0.00	44.00	0.00		0.00
19.00	0.01		0.01	44.50	0.00		0.00
19.50	0.01		0.01	45.00	0.00		0.00
20.00	0.01		0.01	45.50	0.00		0.00
20.50	0.01		0.01	46.00	0.00		0.00
21.00	0.01		0.01	46.50	0.00		0.00
21.50	0.01		0.01	47.00	0.00		0.00
22.00	0.01		0.01	47.50	0.00		0.00
22.50	0.01		0.01	48.00	0.00		0.00
23.00	0.01		0.01				
23.50	0.01		0.01				
24.00	**0.01**		**0.01**				
24.50	**0.01**		**0.01**				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				

Summary for Pond 6P: Wet Pond

Inflow Area = 222,940 sf, 0.00% Impervious, Inflow Depth = 0.07" for 10-yr event
Inflow = 0.04 cfs @ 15.71 hrs, Volume= 1,261 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,243.01' @ 25.70 hrs Surf.Area= 2,672 sf Storage= 1,261 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

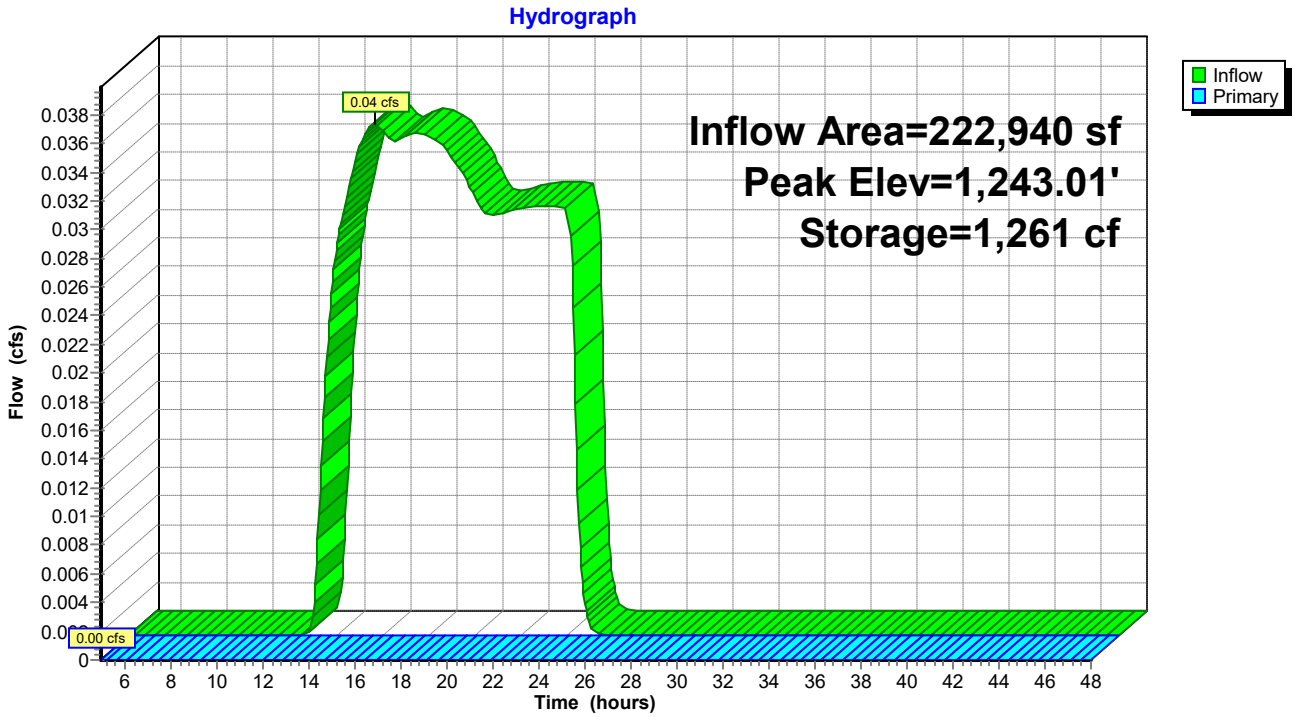
Volume	Invert	Avail.Storage	Storage Description
#1	1,242.50'	48,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,242.50	2,285	0	0
1,244.00	3,425	4,283	4,283
1,246.00	5,081	8,506	12,789
1,248.00	6,932	12,013	24,802
1,250.00	8,031	14,963	39,765
1,251.00	10,320	9,176	48,940

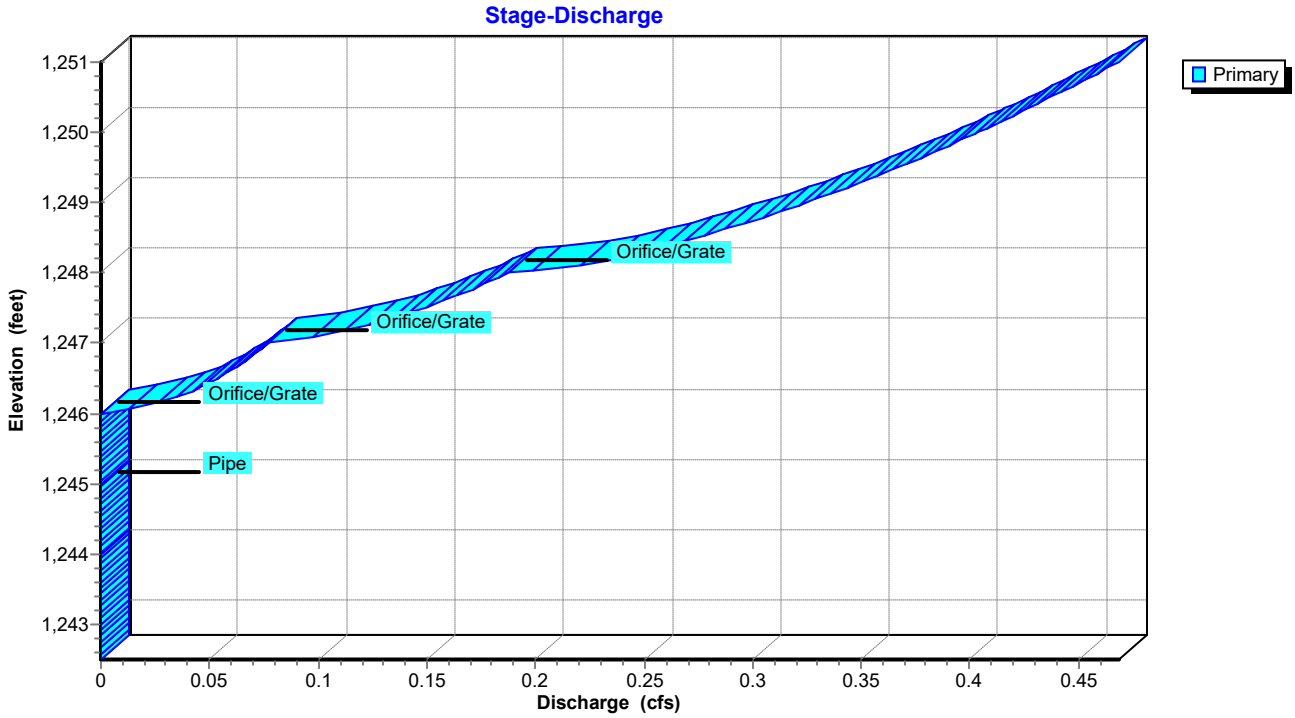
Device	Routing	Invert	Outlet Devices
#1	Primary	1,245.00'	**15.0" Round Pipe** L= 100.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,245.00' / 1,243.00' S= 0.0200 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	1,246.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	1,247.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,248.00'	**1.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,242.50' (Free Discharge)
└─**1=Pipe** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Wet Pond



Pond 6P: Wet Pond



Hydrograph for Pond 6P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	1,242.50	**0.00**
6.00	0.00	0	1,242.50	0.00
7.00	0.00	0	1,242.50	0.00
8.00	0.00	0	1,242.50	0.00
9.00	0.00	0	1,242.50	0.00
10.00	0.00	0	1,242.50	0.00
11.00	0.00	0	1,242.50	0.00
12.00	0.00	0	1,242.50	0.00
13.00	0.00	0	1,242.50	0.00
14.00	0.03	56	1,242.52	0.00
15.00	**0.03**	167	1,242.57	0.00
16.00	**0.04**	294	1,242.63	0.00
17.00	0.03	418	1,242.68	0.00
18.00	0.03	544	1,242.73	0.00
19.00	0.03	668	1,242.78	0.00
20.00	0.03	784	1,242.83	0.00
21.00	0.03	890	1,242.87	0.00
22.00	0.03	997	1,242.91	0.00
23.00	0.03	1,104	1,242.95	0.00
24.00	0.03	1,212	1,242.99	0.00
25.00	0.00	**1,261**	**1,243.01**	0.00
26.00	0.00	**1,261**	**1,243.01**	0.00
27.00	0.00	1,261	1,243.01	0.00
28.00	0.00	1,261	1,243.01	0.00
29.00	0.00	1,261	1,243.01	0.00
30.00	0.00	1,261	1,243.01	0.00
31.00	0.00	1,261	1,243.01	0.00
32.00	0.00	1,261	1,243.01	0.00
33.00	0.00	1,261	1,243.01	0.00
34.00	0.00	1,261	1,243.01	0.00
35.00	0.00	1,261	1,243.01	0.00
36.00	0.00	1,261	1,243.01	0.00
37.00	0.00	1,261	1,243.01	0.00
38.00	0.00	1,261	1,243.01	0.00
39.00	0.00	1,261	1,243.01	0.00
40.00	0.00	1,261	1,243.01	0.00
41.00	0.00	1,261	1,243.01	0.00
42.00	0.00	1,261	1,243.01	0.00
43.00	0.00	1,261	1,243.01	0.00
44.00	0.00	1,261	1,243.01	0.00
45.00	0.00	1,261	1,243.01	0.00
46.00	0.00	1,261	1,243.01	0.00
47.00	0.00	1,261	1,243.01	0.00
48.00	0.00	1,261	1,243.01	0.00

Stage-Discharge for Pond 6P: Wet Pond

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,242.50	0.00	1,247.60	0.16
1,242.60	0.00	1,247.70	0.17
1,242.70	0.00	1,247.80	0.17
1,242.80	0.00	1,247.90	0.18
1,242.90	0.00	1,248.00	0.19
1,243.00	0.00	1,248.10	0.22
1,243.10	0.00	1,248.20	0.24
1,243.20	0.00	1,248.30	0.25
1,243.30	0.00	1,248.40	0.26
1,243.40	0.00	1,248.50	0.27
1,243.50	0.00	1,248.60	0.29
1,243.60	0.00	1,248.70	0.30
1,243.70	0.00	1,248.80	0.31
1,243.80	0.00	1,248.90	0.32
1,243.90	0.00	1,249.00	0.32
1,244.00	0.00	1,249.10	0.33
1,244.10	0.00	1,249.20	0.34
1,244.20	0.00	1,249.30	0.35
1,244.30	0.00	1,249.40	0.36
1,244.40	0.00	1,249.50	0.37
1,244.50	0.00	1,249.60	0.37
1,244.60	0.00	1,249.70	0.38
1,244.70	0.00	1,249.80	0.39
1,244.80	0.00	1,249.90	0.40
1,244.90	0.00	1,250.00	0.40
1,245.00	0.00	1,250.10	0.41
1,245.10	0.00	1,250.20	0.42
1,245.20	0.00	1,250.30	0.42
1,245.30	0.00	1,250.40	0.43
1,245.40	0.00	1,250.50	0.44
1,245.50	0.00	1,250.60	0.44
1,245.60	0.00	1,250.70	0.45
1,245.70	0.00	1,250.80	0.46
1,245.80	0.00	1,250.90	0.46
1,245.90	0.00	1,251.00	**0.47**
1,246.00	0.00		
1,246.10	0.02		
1,246.20	0.03		
1,246.30	0.04		
1,246.40	0.05		
1,246.50	0.05		
1,246.60	0.06		
1,246.70	0.06		
1,246.80	0.07		
1,246.90	0.07		
1,247.00	0.08		
1,247.10	0.10		
1,247.20	0.12		
1,247.30	0.13		
1,247.40	0.14		
1,247.50	0.15		

Stage-Area-Storage for Pond 6P: Wet Pond

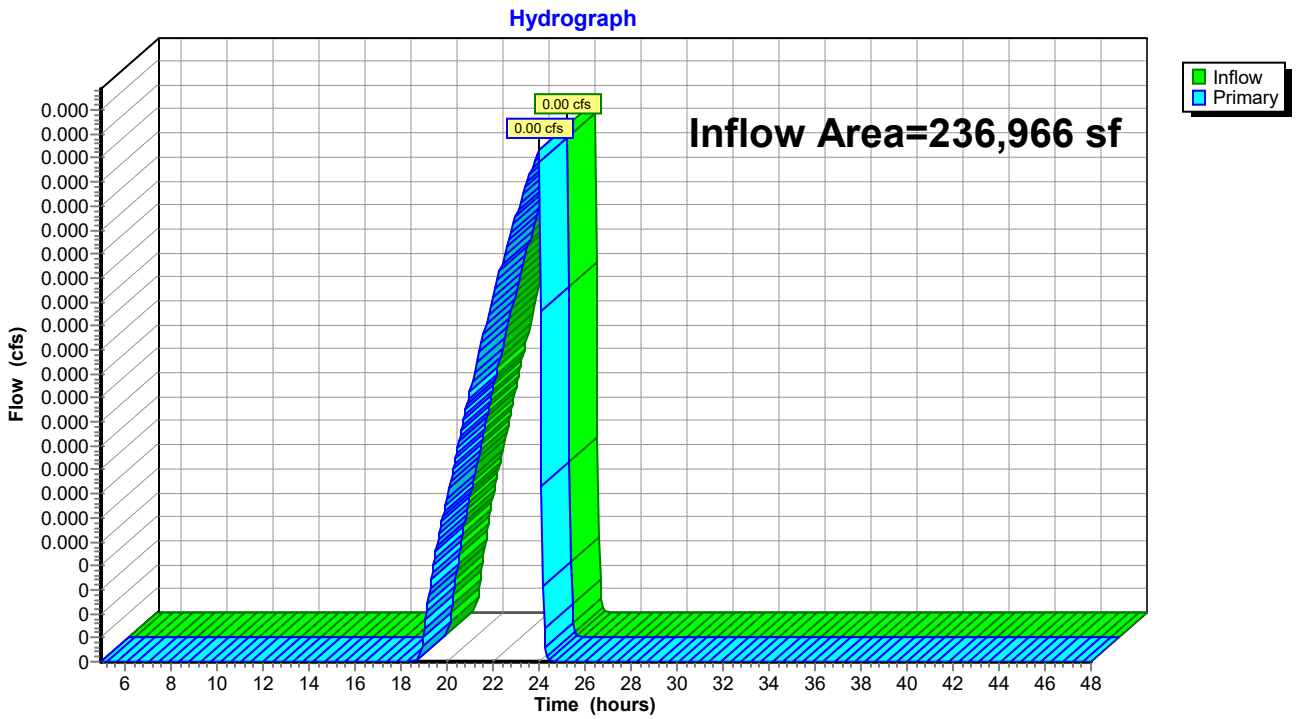
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,242.50	2,285	0
1,242.60	2,361	232
1,242.70	2,437	472
1,242.80	2,513	720
1,242.90	2,589	975
1,243.00	2,665	1,238
1,243.10	2,741	1,508
1,243.20	2,817	1,786
1,243.30	2,893	2,071
1,243.40	2,969	2,364
1,243.50	3,045	2,665
1,243.60	3,121	2,973
1,243.70	3,197	3,289
1,243.80	3,273	3,613
1,243.90	3,349	3,944
1,244.00	3,425	4,283
1,244.10	3,508	4,629
1,244.20	3,591	4,984
1,244.30	3,673	5,347
1,244.40	3,756	5,719
1,244.50	3,839	6,099
1,244.60	3,922	6,487
1,244.70	4,005	6,883
1,244.80	4,087	7,287
1,244.90	4,170	7,700
1,245.00	4,253	8,122
1,245.10	4,336	8,551
1,245.20	4,419	8,989
1,245.30	4,501	9,435
1,245.40	4,584	9,889
1,245.50	4,667	10,352
1,245.60	4,750	10,822
1,245.70	4,833	11,301
1,245.80	4,915	11,789
1,245.90	4,998	12,285
1,246.00	5,081	12,789
1,246.10	5,174	13,301
1,246.20	5,266	13,823
1,246.30	5,359	14,354
1,246.40	5,451	14,895
1,246.50	5,544	15,445
1,246.60	5,636	16,004
1,246.70	5,729	16,572
1,246.80	5,821	17,149
1,246.90	5,914	17,736
1,247.00	6,007	18,332
1,247.10	6,099	18,938
1,247.20	6,192	19,552
1,247.30	6,284	20,176
1,247.40	6,377	20,809
1,247.50	6,469	21,451
1,247.60	6,562	22,103
1,247.70	6,654	22,764
1,247.80	6,747	23,434
1,247.90	6,839	24,113
1,248.00	6,932	24,802
1,248.10	6,987	25,497
1,248.20	7,042	26,199
1,248.30	7,097	26,906
1,248.40	7,152	27,618
1,248.50	7,207	28,336
1,248.60	7,262	29,060
1,248.70	7,317	29,789
1,248.80	7,372	30,523
1,248.90	7,427	31,263
1,249.00	7,482	32,008
1,249.10	7,536	32,759
1,249.20	7,591	33,516
1,249.30	7,646	34,277
1,249.40	7,701	35,045
1,249.50	7,756	35,818
1,249.60	7,811	36,596
1,249.70	7,866	37,380
1,249.80	7,921	38,169
1,249.90	7,976	38,964
1,250.00	8,031	39,765
1,250.10	8,260	40,579
1,250.20	8,489	41,416
1,250.30	8,718	42,277
1,250.40	8,947	43,160
1,250.50	9,176	44,066
1,250.60	9,404	44,995
1,250.70	9,633	45,947
1,250.80	9,862	46,922
1,250.90	10,091	47,919
1,251.00	**10,320**	**48,940**

Summary for Link 5L:

Inflow Area = 236,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 10-yr event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 5 cf
Primary = 0.00 cfs @ 24.00 hrs, Volume= 5 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Link 5L:



Hydrograph for Link 5L:

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00	30.50	0.00	0.00	0.00
5.50	0.00	0.00	0.00	31.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	31.50	0.00	0.00	0.00
6.50	0.00	0.00	0.00	32.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	32.50	0.00	0.00	0.00
7.50	0.00	0.00	0.00	33.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	33.50	0.00	0.00	0.00
8.50	0.00	0.00	0.00	34.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	34.50	0.00	0.00	0.00
9.50	0.00	0.00	0.00	35.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	35.50	0.00	0.00	0.00
10.50	0.00	0.00	0.00	36.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	36.50	0.00	0.00	0.00
11.50	0.00	0.00	0.00	37.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	37.50	0.00	0.00	0.00
12.50	0.00	0.00	0.00	38.00	0.00	0.00	0.00
13.00	0.00	0.00	0.00	38.50	0.00	0.00	0.00
13.50	0.00	0.00	0.00	39.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	39.50	0.00	0.00	0.00
14.50	0.00	0.00	0.00	40.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	40.50	0.00	0.00	0.00
15.50	0.00	0.00	0.00	41.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	41.50	0.00	0.00	0.00
16.50	0.00	0.00	0.00	42.00	0.00	0.00	0.00
17.00	0.00	0.00	0.00	42.50	0.00	0.00	0.00
17.50	0.00	0.00	0.00	43.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00	43.50	0.00	0.00	0.00
18.50	0.00	0.00	0.00	44.00	0.00	0.00	0.00
19.00	0.00	0.00	0.00	44.50	0.00	0.00	0.00
19.50	0.00	0.00	0.00	45.00	0.00	0.00	0.00
20.00	0.00	0.00	0.00	45.50	0.00	0.00	0.00
20.50	0.00	0.00	0.00	46.00	0.00	0.00	0.00
21.00	0.00	0.00	0.00	46.50	0.00	0.00	0.00
21.50	0.00	0.00	0.00	47.00	0.00	0.00	0.00
22.00	0.00	0.00	0.00	47.50	0.00	0.00	0.00
22.50	0.00	0.00	0.00	48.00	0.00	0.00	0.00
23.00	0.00	0.00	0.00				
23.50	0.00	0.00	0.00				
24.00	**0.00**	0.00	**0.00**				
24.50	0.00	0.00	0.00				
25.00	0.00	0.00	0.00				
25.50	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
26.50	0.00	0.00	0.00				
27.00	0.00	0.00	0.00				
27.50	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
28.50	0.00	0.00	0.00				
29.00	0.00	0.00	0.00				
29.50	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.442 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=561' Tc=19.7 min CN=33 Runoff=0.01 cfs 362 cf

Subcatchment 6S: DA-2 Runoff Area=5.118 ac 0.00% Impervious Runoff Depth=0.22"
Flow Length=868' Tc=29.6 min CN=38 Runoff=0.18 cfs 4,122 cf

Subcatchment 7S: DA-3 Runoff Area=4.547 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=822' Tc=41.1 min CN=34 Runoff=0.04 cfs 1,549 cf

Subcatchment 8S: DA-4 Runoff Area=0.322 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=77' Slope=0.2000 '/' Tc=8.8 min CN=33 Runoff=0.00 cfs 81 cf

Reach 10R: Post w/BMP Inflow=0.06 cfs 1,992 cf
Outflow=0.06 cfs 1,992 cf

Pond 6P: Wet Pond Peak Elev=1,243.95' Storage=4,122 cf Inflow=0.18 cfs 4,122 cf
Outflow=0.00 cfs 0 cf

Link 5L: Inflow=0.00 cfs 81 cf
Primary=0.00 cfs 81 cf

Total Runoff Area = 497,847 sf Runoff Volume = 6,114 cf Average Runoff Depth = 0.15"
100.00% Pervious = 497,847 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

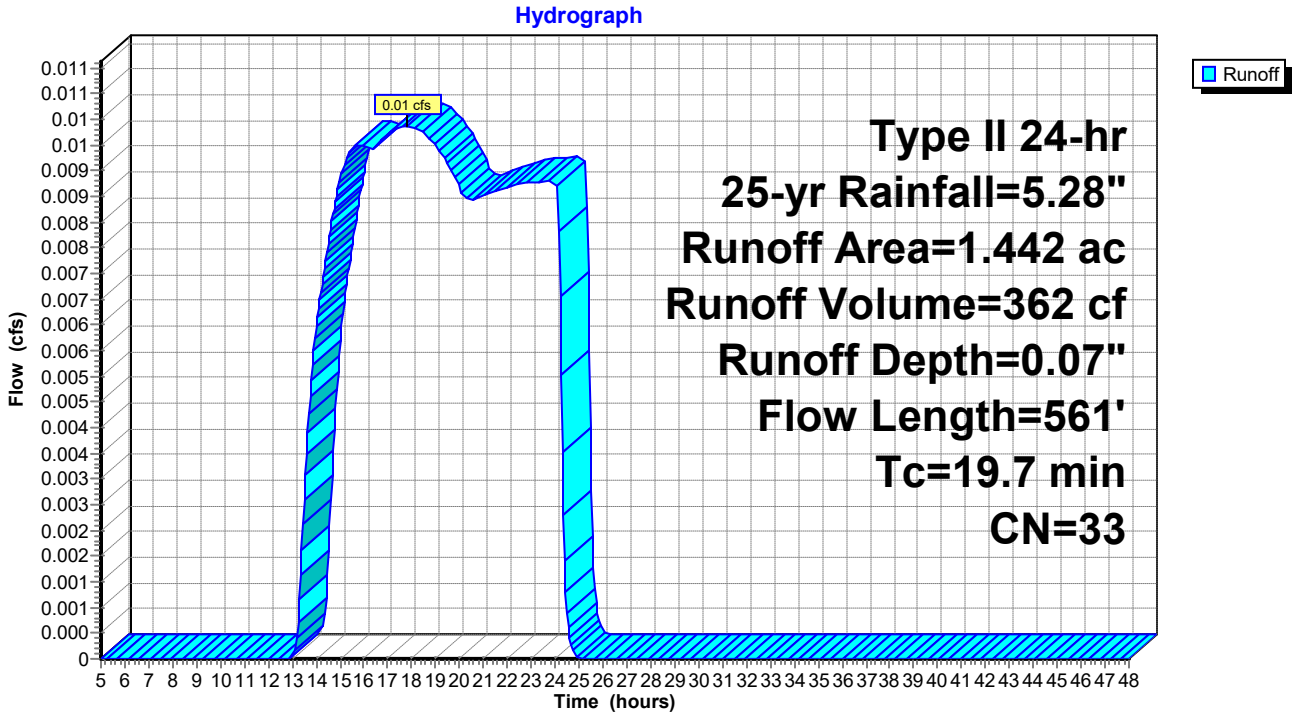
Runoff = 0.01 cfs @ 17.77 hrs, Volume= 362 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.28"

Area (ac)	CN	Description
0.707	36	Woods, Fair, HSG A
0.735	30	Meadow, non-grazed, HSG A
1.442	33	Weighted Average
1.442		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	76	0.1050	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.8	485	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	561	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.33	0.00	0.00
5.50	0.38	0.00	0.00
6.00	0.42	0.00	0.00
6.50	0.47	0.00	0.00
7.00	0.52	0.00	0.00
7.50	0.58	0.00	0.00
8.00	0.63	0.00	0.00
8.50	0.70	0.00	0.00
9.00	0.78	0.00	0.00
9.50	0.86	0.00	0.00
10.00	0.96	0.00	0.00
10.50	1.08	0.00	0.00
11.00	1.24	0.00	0.00
11.50	1.49	0.00	0.00
12.00	3.50	0.00	0.00
12.50	3.88	0.00	0.00
13.00	4.08	0.00	0.00
13.50	4.22	0.00	0.00
14.00	4.33	0.00	0.01
14.50	4.42	0.01	0.01
15.00	4.51	0.01	0.01
15.50	4.58	0.01	0.01
16.00	4.65	0.02	0.01
16.50	4.71	0.02	0.01
17.00	4.76	0.02	0.01
17.50	4.81	0.03	**0.01**
18.00	4.86	0.03	**0.01**
18.50	4.91	0.03	0.01
19.00	4.95	0.04	0.01
19.50	4.99	0.04	0.01
20.00	5.03	0.04	0.01
20.50	5.06	0.05	0.01
21.00	5.09	0.05	0.01
21.50	5.13	0.05	0.01
22.00	5.16	0.06	0.01
22.50	5.19	0.06	0.01
23.00	5.22	0.06	0.01
23.50	5.25	0.07	0.01
24.00	**5.28**	**0.07**	0.01
24.50	5.28	0.07	0.00
25.00	5.28	0.07	0.00
25.50	5.28	0.07	0.00
26.00	5.28	0.07	0.00
26.50	5.28	0.07	0.00
27.00	5.28	0.07	0.00
27.50	5.28	0.07	0.00
28.00	5.28	0.07	0.00
28.50	5.28	0.07	0.00
29.00	5.28	0.07	0.00
29.50	5.28	0.07	0.00
30.00	5.28	0.07	0.00
30.50	5.28	0.07	0.00
31.00	5.28	0.07	0.00
31.50	5.28	0.07	0.00
32.00	5.28	0.07	0.00
32.50	5.28	0.07	0.00
33.00	5.28	0.07	0.00
33.50	5.28	0.07	0.00
34.00	5.28	0.07	0.00
34.50	5.28	0.07	0.00
35.00	5.28	0.07	0.00
35.50	5.28	0.07	0.00
36.00	5.28	0.07	0.00
36.50	5.28	0.07	0.00
37.00	5.28	0.07	0.00
37.50	5.28	0.07	0.00
38.00	5.28	0.07	0.00
38.50	5.28	0.07	0.00
39.00	5.28	0.07	0.00
39.50	5.28	0.07	0.00
40.00	5.28	0.07	0.00
40.50	5.28	0.07	0.00
41.00	5.28	0.07	0.00
41.50	5.28	0.07	0.00
42.00	5.28	0.07	0.00
42.50	5.28	0.07	0.00
43.00	5.28	0.07	0.00
43.50	5.28	0.07	0.00
44.00	5.28	0.07	0.00
44.50	5.28	0.07	0.00
45.00	5.28	0.07	0.00
45.50	5.28	0.07	0.00
46.00	5.28	0.07	0.00
46.50	5.28	0.07	0.00
47.00	5.28	0.07	0.00
47.50	5.28	0.07	0.00
48.00	5.28	0.07	0.00

Summary for Subcatchment 6S: DA-2

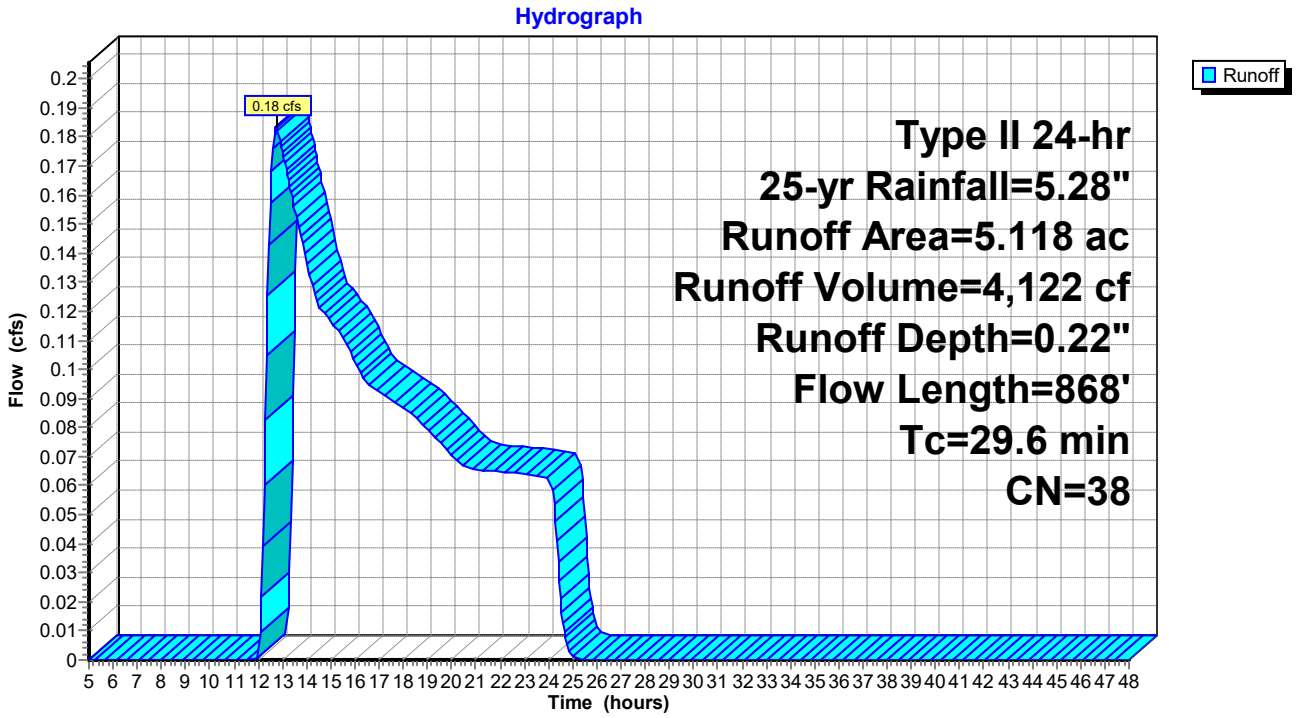
Runoff = 0.18 cfs @ 12.74 hrs, Volume= 4,122 cf, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.28"

	Area (ac)	CN	Description
	3.101	36	Woods, Fair, HSG A
	1.615	30	Meadow, non-grazed, HSG A
*	0.402	89	Gravel area
	5.118	38	Weighted Average
	5.118		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3	80	0.0500	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.5	262	0.0610	1.23		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	122	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	56	0.1070	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	232	0.0520	3.81	6.86	**Channel Flow, Diversion Channel** Area= 1.8 sf Perim= 5.0' r= 0.36' n= 0.045
2.1	116	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.6	868	Total			

Subcatchment 6S: DA-2



Hydrograph for Subcatchment 6S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.33	0.00	0.00
5.50	0.38	0.00	0.00
6.00	0.42	0.00	0.00
6.50	0.47	0.00	0.00
7.00	0.52	0.00	0.00
7.50	0.58	0.00	0.00
8.00	0.63	0.00	0.00
8.50	0.70	0.00	0.00
9.00	0.78	0.00	0.00
9.50	0.86	0.00	0.00
10.00	0.96	0.00	0.00
10.50	1.08	0.00	0.00
11.00	1.24	0.00	0.00
11.50	1.49	0.00	0.00
12.00	3.50	0.00	0.00
12.50	3.88	0.02	**0.16**
13.00	4.08	0.04	**0.17**
13.50	4.22	0.05	0.16
14.00	4.33	0.07	0.14
14.50	4.42	0.08	0.12
15.00	4.51	0.09	0.12
15.50	4.58	0.10	0.11
16.00	4.65	0.11	0.10
16.50	4.71	0.12	0.10
17.00	4.76	0.13	0.09
17.50	4.81	0.13	0.09
18.00	4.86	0.14	0.09
18.50	4.91	0.15	0.08
19.00	4.95	0.16	0.08
19.50	4.99	0.17	0.08
20.00	5.03	0.17	0.07
20.50	5.06	0.18	0.07
21.00	5.09	0.18	0.07
21.50	5.13	0.19	0.07
22.00	5.16	0.20	0.06
22.50	5.19	0.20	0.06
23.00	5.22	0.21	0.06
23.50	5.25	0.22	0.06
24.00	**5.28**	**0.22**	0.06
24.50	5.28	0.22	0.02
25.00	5.28	0.22	0.00
25.50	5.28	0.22	0.00
26.00	5.28	0.22	0.00
26.50	5.28	0.22	0.00
27.00	5.28	0.22	0.00
27.50	5.28	0.22	0.00
28.00	5.28	0.22	0.00
28.50	5.28	0.22	0.00
29.00	5.28	0.22	0.00
29.50	5.28	0.22	0.00
30.00	5.28	0.22	0.00
30.50	5.28	0.22	0.00
31.00	5.28	0.22	0.00
31.50	5.28	0.22	0.00
32.00	5.28	0.22	0.00
32.50	5.28	0.22	0.00
33.00	5.28	0.22	0.00
33.50	5.28	0.22	0.00
34.00	5.28	0.22	0.00
34.50	5.28	0.22	0.00
35.00	5.28	0.22	0.00
35.50	5.28	0.22	0.00
36.00	5.28	0.22	0.00
36.50	5.28	0.22	0.00
37.00	5.28	0.22	0.00
37.50	5.28	0.22	0.00
38.00	5.28	0.22	0.00
38.50	5.28	0.22	0.00
39.00	5.28	0.22	0.00
39.50	5.28	0.22	0.00
40.00	5.28	0.22	0.00
40.50	5.28	0.22	0.00
41.00	5.28	0.22	0.00
41.50	5.28	0.22	0.00
42.00	5.28	0.22	0.00
42.50	5.28	0.22	0.00
43.00	5.28	0.22	0.00
43.50	5.28	0.22	0.00
44.00	5.28	0.22	0.00
44.50	5.28	0.22	0.00
45.00	5.28	0.22	0.00
45.50	5.28	0.22	0.00
46.00	5.28	0.22	0.00
46.50	5.28	0.22	0.00
47.00	5.28	0.22	0.00
47.50	5.28	0.22	0.00
48.00	5.28	0.22	0.00

Summary for Subcatchment 7S: DA-3

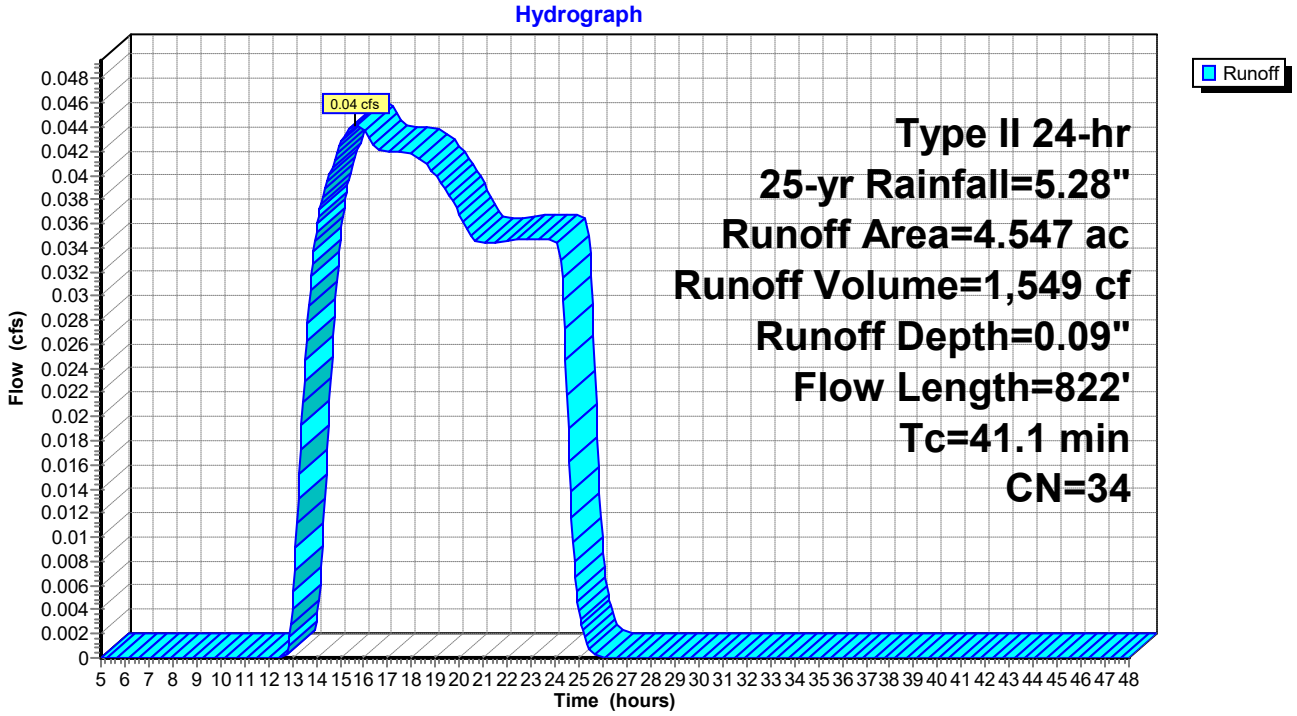
Runoff = 0.04 cfs @ 15.66 hrs, Volume= 1,549 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.28"

Area (ac)	CN	Description
3.255	36	Woods, Fair, HSG A
1.292	30	Meadow, non-grazed, HSG A
4.547	34	Weighted Average
4.547		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.6	98	0.0250	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
5.8	592	0.1140	1.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	132	0.1780	2.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
41.1	822	Total			

Subcatchment 7S: DA-3



Hydrograph for Subcatchment 7S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.33	0.00	0.00
5.50	0.38	0.00	0.00
6.00	0.42	0.00	0.00
6.50	0.47	0.00	0.00
7.00	0.52	0.00	0.00
7.50	0.58	0.00	0.00
8.00	0.63	0.00	0.00
8.50	0.70	0.00	0.00
9.00	0.78	0.00	0.00
9.50	0.86	0.00	0.00
10.00	0.96	0.00	0.00
10.50	1.08	0.00	0.00
11.00	1.24	0.00	0.00
11.50	1.49	0.00	0.00
12.00	3.50	0.00	0.00
12.50	3.88	0.00	0.00
13.00	4.08	0.00	0.00
13.50	4.22	0.01	0.02
14.00	4.33	0.01	0.04
14.50	4.42	0.01	0.04
15.00	4.51	0.02	0.04
15.50	4.58	0.02	**0.04**
16.00	4.65	0.03	**0.04**
16.50	4.71	0.03	0.04
17.00	4.76	0.04	0.04
17.50	4.81	0.04	0.04
18.00	4.86	0.05	0.04
18.50	4.91	0.05	0.04
19.00	4.95	0.06	0.04
19.50	4.99	0.06	0.04
20.00	5.03	0.06	0.04
20.50	5.06	0.07	0.03
21.00	5.09	0.07	0.03
21.50	5.13	0.07	0.03
22.00	5.16	0.08	0.03
22.50	5.19	0.08	0.03
23.00	5.22	0.09	0.03
23.50	5.25	0.09	0.03
24.00	**5.28**	**0.09**	0.03
24.50	5.28	0.09	0.02
25.00	5.28	0.09	0.00
25.50	5.28	0.09	0.00
26.00	5.28	0.09	0.00
26.50	5.28	0.09	0.00
27.00	5.28	0.09	0.00
27.50	5.28	0.09	0.00
28.00	5.28	0.09	0.00
28.50	5.28	0.09	0.00
29.00	5.28	0.09	0.00
29.50	5.28	0.09	0.00
30.00	5.28	0.09	0.00
30.50	5.28	0.09	0.00
31.00	5.28	0.09	0.00
31.50	5.28	0.09	0.00
32.00	5.28	0.09	0.00
32.50	5.28	0.09	0.00
33.00	5.28	0.09	0.00
33.50	5.28	0.09	0.00
34.00	5.28	0.09	0.00
34.50	5.28	0.09	0.00
35.00	5.28	0.09	0.00
35.50	5.28	0.09	0.00
36.00	5.28	0.09	0.00
36.50	5.28	0.09	0.00
37.00	5.28	0.09	0.00
37.50	5.28	0.09	0.00
38.00	5.28	0.09	0.00
38.50	5.28	0.09	0.00
39.00	5.28	0.09	0.00
39.50	5.28	0.09	0.00
40.00	5.28	0.09	0.00
40.50	5.28	0.09	0.00
41.00	5.28	0.09	0.00
41.50	5.28	0.09	0.00
42.00	5.28	0.09	0.00
42.50	5.28	0.09	0.00
43.00	5.28	0.09	0.00
43.50	5.28	0.09	0.00
44.00	5.28	0.09	0.00
44.50	5.28	0.09	0.00
45.00	5.28	0.09	0.00
45.50	5.28	0.09	0.00
46.00	5.28	0.09	0.00
46.50	5.28	0.09	0.00
47.00	5.28	0.09	0.00
47.50	5.28	0.09	0.00
48.00	5.28	0.09	0.00

Summary for Subcatchment 8S: DA-4

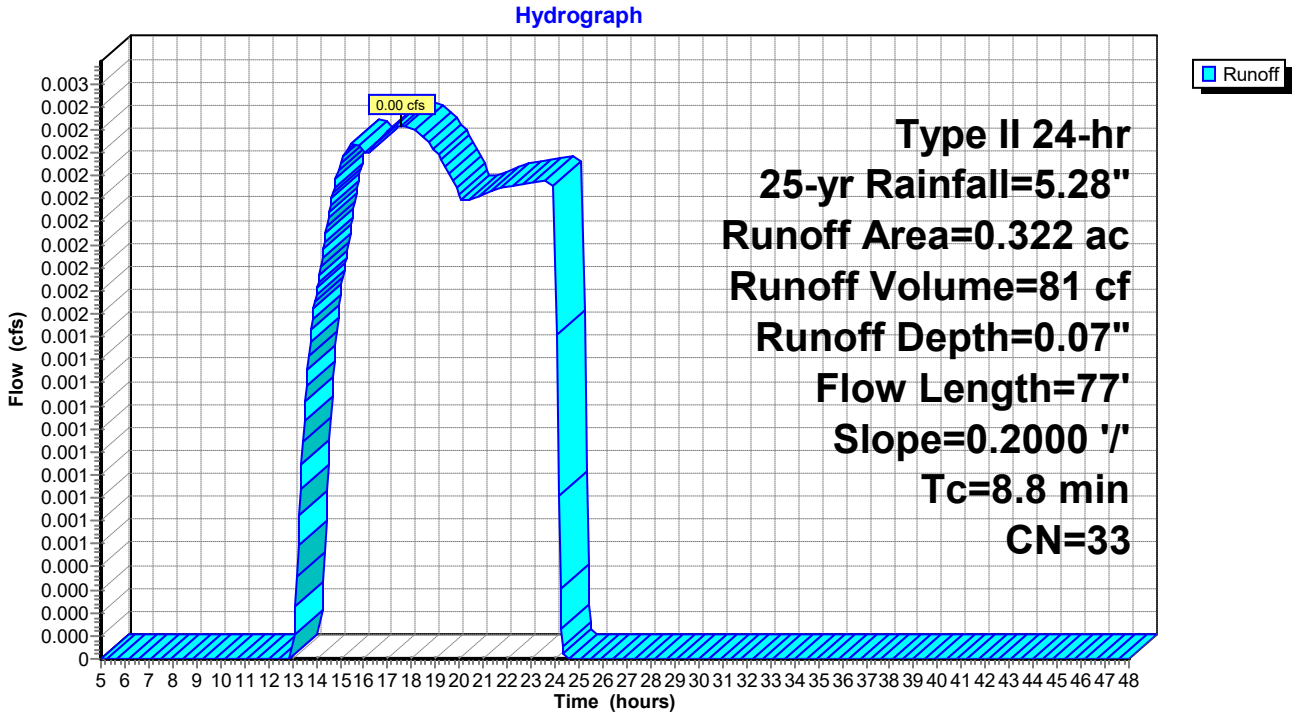
Runoff = 0.00 cfs @ 17.55 hrs, Volume= 81 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.28"

Area (ac)	CN	Description
0.143	36	Woods, Fair, HSG A
0.179	30	Meadow, non-grazed, HSG A
0.322	33	Weighted Average
0.322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	40	0.2000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.03"
6.9	37	0.2000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
8.8	77	Total			

Subcatchment 8S: DA-4



Hydrograph for Subcatchment 8S: DA-4

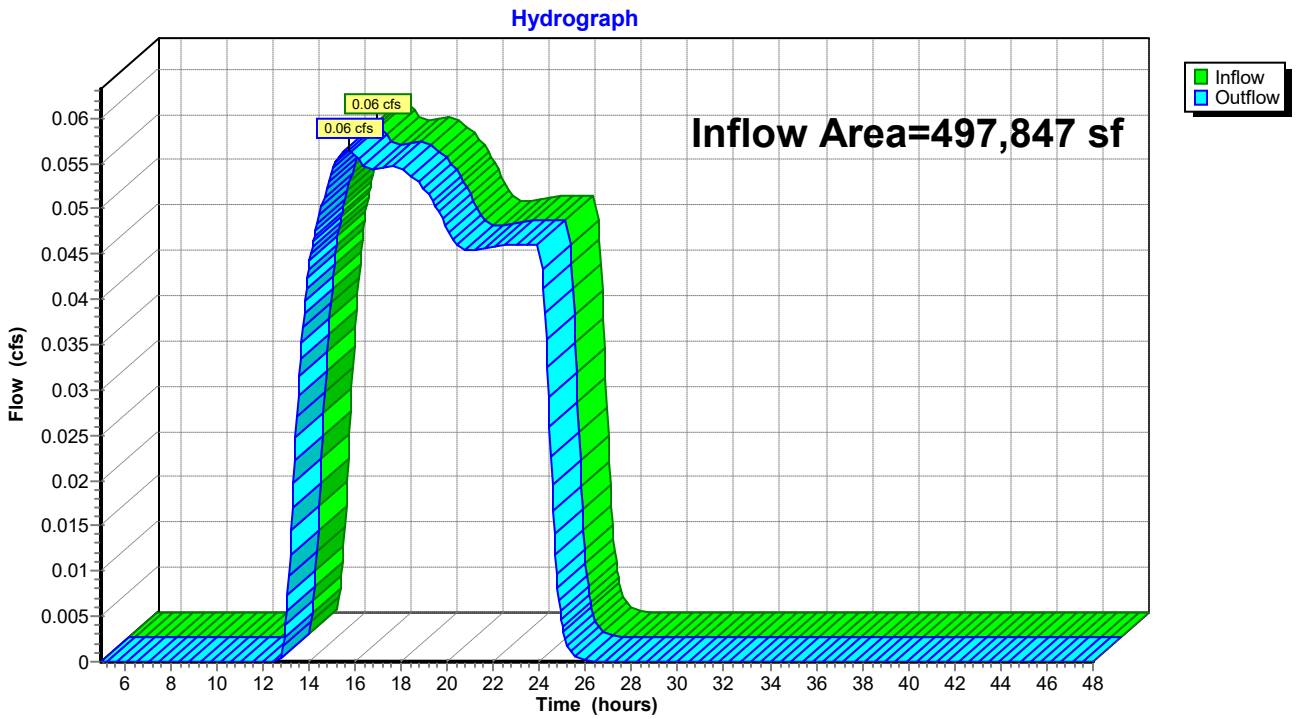
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.33	0.00	0.00
5.50	0.38	0.00	0.00
6.00	0.42	0.00	0.00
6.50	0.47	0.00	0.00
7.00	0.52	0.00	0.00
7.50	0.58	0.00	0.00
8.00	0.63	0.00	0.00
8.50	0.70	0.00	0.00
9.00	0.78	0.00	0.00
9.50	0.86	0.00	0.00
10.00	0.96	0.00	0.00
10.50	1.08	0.00	0.00
11.00	1.24	0.00	0.00
11.50	1.49	0.00	0.00
12.00	3.50	0.00	0.00
12.50	3.88	0.00	0.00
13.00	4.08	0.00	0.00
13.50	4.22	0.00	0.00
14.00	4.33	0.00	0.00
14.50	4.42	0.01	0.00
15.00	4.51	0.01	0.00
15.50	4.58	0.01	0.00
16.00	4.65	0.02	0.00
16.50	4.71	0.02	0.00
17.00	4.76	0.02	0.00
17.50	4.81	0.03	**0.00**
18.00	4.86	0.03	**0.00**
18.50	4.91	0.03	0.00
19.00	4.95	0.04	0.00
19.50	4.99	0.04	0.00
20.00	5.03	0.04	0.00
20.50	5.06	0.05	0.00
21.00	5.09	0.05	0.00
21.50	5.13	0.05	0.00
22.00	5.16	0.06	0.00
22.50	5.19	0.06	0.00
23.00	5.22	0.06	0.00
23.50	5.25	0.07	0.00
24.00	**5.28**	**0.07**	0.00
24.50	5.28	0.07	0.00
25.00	5.28	0.07	0.00
25.50	5.28	0.07	0.00
26.00	5.28	0.07	0.00
26.50	5.28	0.07	0.00
27.00	5.28	0.07	0.00
27.50	5.28	0.07	0.00
28.00	5.28	0.07	0.00
28.50	5.28	0.07	0.00
29.00	5.28	0.07	0.00
29.50	5.28	0.07	0.00
30.00	5.28	0.07	0.00
30.50	5.28	0.07	0.00
31.00	5.28	0.07	0.00
31.50	5.28	0.07	0.00
32.00	5.28	0.07	0.00
32.50	5.28	0.07	0.00
33.00	5.28	0.07	0.00
33.50	5.28	0.07	0.00
34.00	5.28	0.07	0.00
34.50	5.28	0.07	0.00
35.00	5.28	0.07	0.00
35.50	5.28	0.07	0.00
36.00	5.28	0.07	0.00
36.50	5.28	0.07	0.00
37.00	5.28	0.07	0.00
37.50	5.28	0.07	0.00
38.00	5.28	0.07	0.00
38.50	5.28	0.07	0.00
39.00	5.28	0.07	0.00
39.50	5.28	0.07	0.00
40.00	5.28	0.07	0.00
40.50	5.28	0.07	0.00
41.00	5.28	0.07	0.00
41.50	5.28	0.07	0.00
42.00	5.28	0.07	0.00
42.50	5.28	0.07	0.00
43.00	5.28	0.07	0.00
43.50	5.28	0.07	0.00
44.00	5.28	0.07	0.00
44.50	5.28	0.07	0.00
45.00	5.28	0.07	0.00
45.50	5.28	0.07	0.00
46.00	5.28	0.07	0.00
46.50	5.28	0.07	0.00
47.00	5.28	0.07	0.00
47.50	5.28	0.07	0.00
48.00	5.28	0.07	0.00

Summary for Reach 10R: Post w/BMP

Inflow Area = 497,847 sf, 0.00% Impervious, Inflow Depth = 0.05" for 25-yr event
Inflow = 0.06 cfs @ 15.74 hrs, Volume= 1,992 cf
Outflow = 0.06 cfs @ 15.74 hrs, Volume= 1,992 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/BMP



Hydrograph for Reach 10R: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	30.50	0.00		0.00
5.50	0.00		0.00	31.00	0.00		0.00
6.00	0.00		0.00	31.50	0.00		0.00
6.50	0.00		0.00	32.00	0.00		0.00
7.00	0.00		0.00	32.50	0.00		0.00
7.50	0.00		0.00	33.00	0.00		0.00
8.00	0.00		0.00	33.50	0.00		0.00
8.50	0.00		0.00	34.00	0.00		0.00
9.00	0.00		0.00	34.50	0.00		0.00
9.50	0.00		0.00	35.00	0.00		0.00
10.00	0.00		0.00	35.50	0.00		0.00
10.50	0.00		0.00	36.00	0.00		0.00
11.00	0.00		0.00	36.50	0.00		0.00
11.50	0.00		0.00	37.00	0.00		0.00
12.00	0.00		0.00	37.50	0.00		0.00
12.50	0.00		0.00	38.00	0.00		0.00
13.00	0.00		0.00	38.50	0.00		0.00
13.50	0.03		0.03	39.00	0.00		0.00
14.00	0.04		0.04	39.50	0.00		0.00
14.50	0.05		0.05	40.00	0.00		0.00
15.00	0.05		0.05	40.50	0.00		0.00
15.50	**0.06**		**0.06**	41.00	0.00		0.00
16.00	**0.06**		**0.06**	41.50	0.00		0.00
16.50	0.05		0.05	42.00	0.00		0.00
17.00	0.05		0.05	42.50	0.00		0.00
17.50	0.05		0.05	43.00	0.00		0.00
18.00	0.05		0.05	43.50	0.00		0.00
18.50	0.05		0.05	44.00	0.00		0.00
19.00	0.05		0.05	44.50	0.00		0.00
19.50	0.05		0.05	45.00	0.00		0.00
20.00	0.05		0.05	45.50	0.00		0.00
20.50	0.05		0.05	46.00	0.00		0.00
21.00	0.05		0.05	46.50	0.00		0.00
21.50	0.05		0.05	47.00	0.00		0.00
22.00	0.05		0.05	47.50	0.00		0.00
22.50	0.05		0.05	48.00	0.00		0.00
23.00	0.05		0.05				
23.50	0.05		0.05				
24.00	0.05		0.05				
24.50	0.02		0.02				
25.00	0.00		0.00				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				

Summary for Pond 6P: Wet Pond

Inflow Area = 222,940 sf, 0.00% Impervious, Inflow Depth = 0.22" for 25-yr event
Inflow = 0.18 cfs @ 12.74 hrs, Volume= 4,122 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,243.95' @ 25.70 hrs Surf.Area= 3,389 sf Storage= 4,122 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

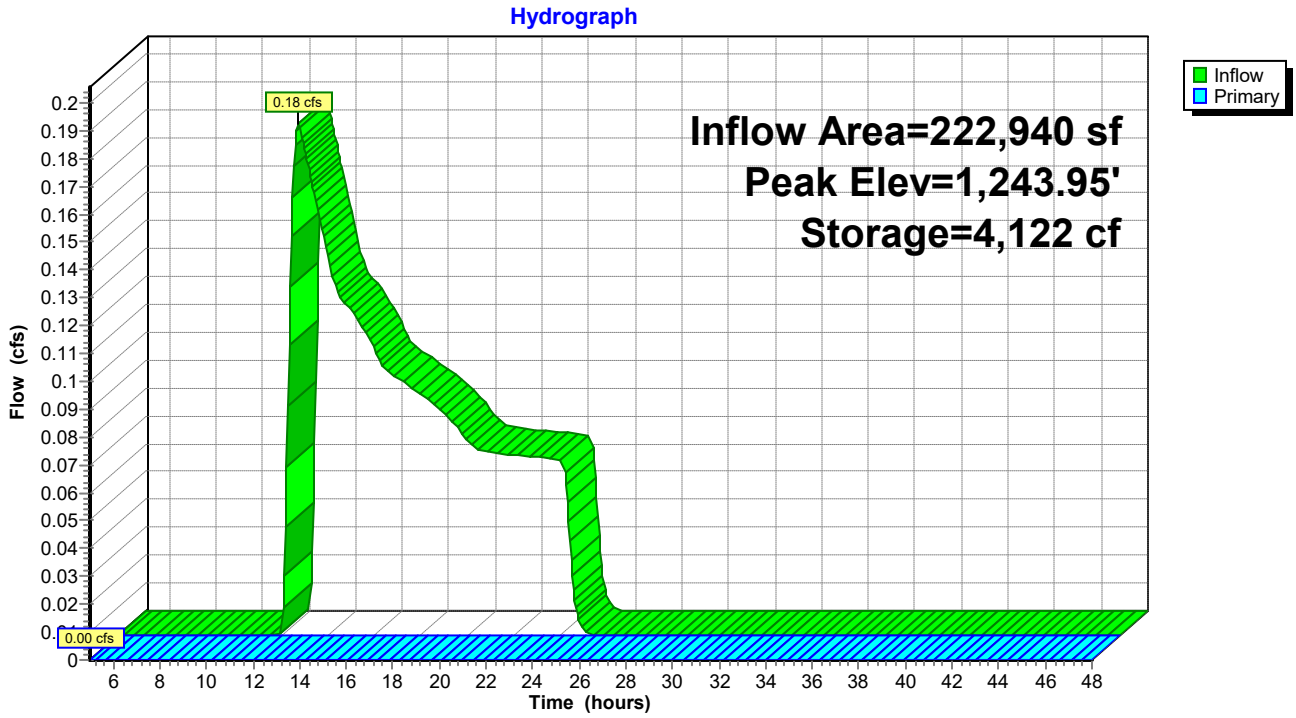
Volume	Invert	Avail.Storage	Storage Description
#1	1,242.50'	48,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,242.50	2,285	0	0
1,244.00	3,425	4,283	4,283
1,246.00	5,081	8,506	12,789
1,248.00	6,932	12,013	24,802
1,250.00	8,031	14,963	39,765
1,251.00	10,320	9,176	48,940

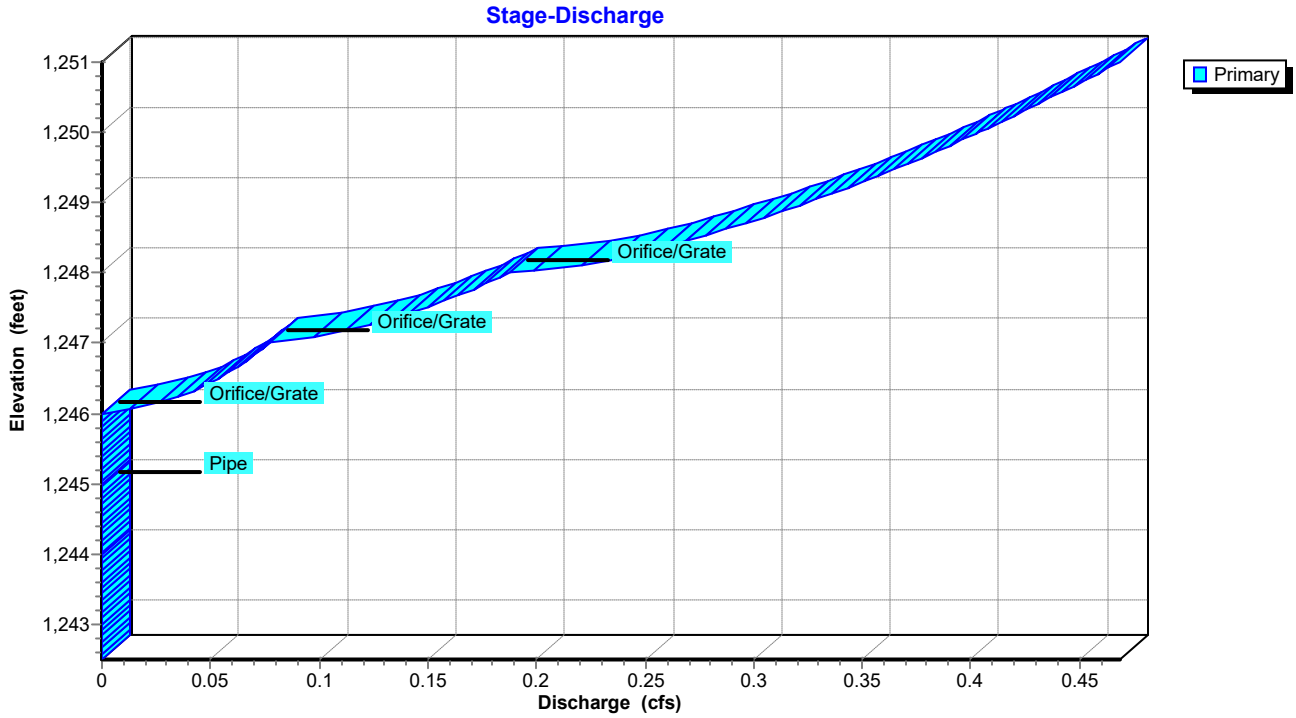
Device	Routing	Invert	Outlet Devices
#1	Primary	1,245.00'	**15.0" Round Pipe** L= 100.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,245.00' / 1,243.00' S= 0.0200 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	1,246.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	1,247.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,248.00'	**1.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,242.50' (Free Discharge)
└─**1=Pipe** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Wet Pond



Pond 6P: Wet Pond



Hydrograph for Pond 6P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	1,242.50	**0.00**
6.00	0.00	0	1,242.50	0.00
7.00	0.00	0	1,242.50	0.00
8.00	0.00	0	1,242.50	0.00
9.00	0.00	0	1,242.50	0.00
10.00	0.00	0	1,242.50	0.00
11.00	0.00	0	1,242.50	0.00
12.00	**0.00**	0	1,242.50	0.00
13.00	**0.17**	440	1,242.69	0.00
14.00	0.14	1,000	1,242.91	0.00
15.00	0.12	1,446	1,243.08	0.00
16.00	0.10	1,844	1,243.22	0.00
17.00	0.09	2,190	1,243.34	0.00
18.00	0.09	2,513	1,243.45	0.00
19.00	0.08	2,812	1,243.55	0.00
20.00	0.07	3,082	1,243.63	0.00
21.00	0.07	3,324	1,243.71	0.00
22.00	0.06	3,558	1,243.78	0.00
23.00	0.06	3,790	1,243.85	0.00
24.00	0.06	4,019	1,243.92	0.00
25.00	0.00	**4,121**	**1,243.95**	0.00
26.00	0.00	**4,122**	**1,243.95**	0.00
27.00	0.00	4,122	1,243.95	0.00
28.00	0.00	4,122	1,243.95	0.00
29.00	0.00	4,122	1,243.95	0.00
30.00	0.00	4,122	1,243.95	0.00
31.00	0.00	4,122	1,243.95	0.00
32.00	0.00	4,122	1,243.95	0.00
33.00	0.00	4,122	1,243.95	0.00
34.00	0.00	4,122	1,243.95	0.00
35.00	0.00	4,122	1,243.95	0.00
36.00	0.00	4,122	1,243.95	0.00
37.00	0.00	4,122	1,243.95	0.00
38.00	0.00	4,122	1,243.95	0.00
39.00	0.00	4,122	1,243.95	0.00
40.00	0.00	4,122	1,243.95	0.00
41.00	0.00	4,122	1,243.95	0.00
42.00	0.00	4,122	1,243.95	0.00
43.00	0.00	4,122	1,243.95	0.00
44.00	0.00	4,122	1,243.95	0.00
45.00	0.00	4,122	1,243.95	0.00
46.00	0.00	4,122	1,243.95	0.00
47.00	0.00	4,122	1,243.95	0.00
48.00	0.00	4,122	1,243.95	0.00

Stage-Discharge for Pond 6P: Wet Pond

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,242.50	0.00	1,247.60	0.16
1,242.60	0.00	1,247.70	0.17
1,242.70	0.00	1,247.80	0.17
1,242.80	0.00	1,247.90	0.18
1,242.90	0.00	1,248.00	0.19
1,243.00	0.00	1,248.10	0.22
1,243.10	0.00	1,248.20	0.24
1,243.20	0.00	1,248.30	0.25
1,243.30	0.00	1,248.40	0.26
1,243.40	0.00	1,248.50	0.27
1,243.50	0.00	1,248.60	0.29
1,243.60	0.00	1,248.70	0.30
1,243.70	0.00	1,248.80	0.31
1,243.80	0.00	1,248.90	0.32
1,243.90	0.00	1,249.00	0.32
1,244.00	0.00	1,249.10	0.33
1,244.10	0.00	1,249.20	0.34
1,244.20	0.00	1,249.30	0.35
1,244.30	0.00	1,249.40	0.36
1,244.40	0.00	1,249.50	0.37
1,244.50	0.00	1,249.60	0.37
1,244.60	0.00	1,249.70	0.38
1,244.70	0.00	1,249.80	0.39
1,244.80	0.00	1,249.90	0.40
1,244.90	0.00	1,250.00	0.40
1,245.00	0.00	1,250.10	0.41
1,245.10	0.00	1,250.20	0.42
1,245.20	0.00	1,250.30	0.42
1,245.30	0.00	1,250.40	0.43
1,245.40	0.00	1,250.50	0.44
1,245.50	0.00	1,250.60	0.44
1,245.60	0.00	1,250.70	0.45
1,245.70	0.00	1,250.80	0.46
1,245.80	0.00	1,250.90	0.46
1,245.90	0.00	1,251.00	**0.47**
1,246.00	0.00		
1,246.10	0.02		
1,246.20	0.03		
1,246.30	0.04		
1,246.40	0.05		
1,246.50	0.05		
1,246.60	0.06		
1,246.70	0.06		
1,246.80	0.07		
1,246.90	0.07		
1,247.00	0.08		
1,247.10	0.10		
1,247.20	0.12		
1,247.30	0.13		
1,247.40	0.14		
1,247.50	0.15		

Stage-Area-Storage for Pond 6P: Wet Pond

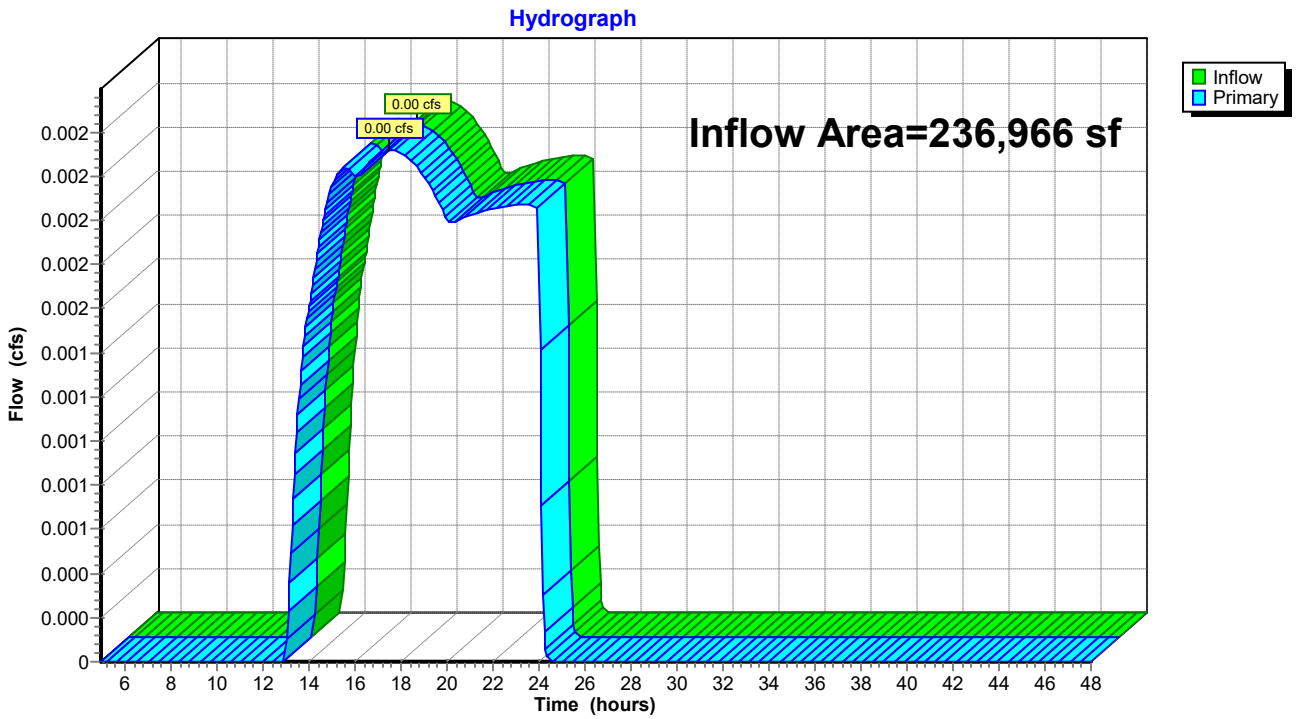
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,242.50	2,285	0
1,242.60	2,361	232
1,242.70	2,437	472
1,242.80	2,513	720
1,242.90	2,589	975
1,243.00	2,665	1,238
1,243.10	2,741	1,508
1,243.20	2,817	1,786
1,243.30	2,893	2,071
1,243.40	2,969	2,364
1,243.50	3,045	2,665
1,243.60	3,121	2,973
1,243.70	3,197	3,289
1,243.80	3,273	3,613
1,243.90	3,349	3,944
1,244.00	3,425	4,283
1,244.10	3,508	4,629
1,244.20	3,591	4,984
1,244.30	3,673	5,347
1,244.40	3,756	5,719
1,244.50	3,839	6,099
1,244.60	3,922	6,487
1,244.70	4,005	6,883
1,244.80	4,087	7,287
1,244.90	4,170	7,700
1,245.00	4,253	8,122
1,245.10	4,336	8,551
1,245.20	4,419	8,989
1,245.30	4,501	9,435
1,245.40	4,584	9,889
1,245.50	4,667	10,352
1,245.60	4,750	10,822
1,245.70	4,833	11,301
1,245.80	4,915	11,789
1,245.90	4,998	12,285
1,246.00	5,081	12,789
1,246.10	5,174	13,301
1,246.20	5,266	13,823
1,246.30	5,359	14,354
1,246.40	5,451	14,895
1,246.50	5,544	15,445
1,246.60	5,636	16,004
1,246.70	5,729	16,572
1,246.80	5,821	17,149
1,246.90	5,914	17,736
1,247.00	6,007	18,332
1,247.10	6,099	18,938
1,247.20	6,192	19,552
1,247.30	6,284	20,176
1,247.40	6,377	20,809
1,247.50	6,469	21,451
1,247.60	6,562	22,103
1,247.70	6,654	22,764
1,247.80	6,747	23,434
1,247.90	6,839	24,113
1,248.00	6,932	24,802
1,248.10	6,987	25,497
1,248.20	7,042	26,199
1,248.30	7,097	26,906
1,248.40	7,152	27,618
1,248.50	7,207	28,336
1,248.60	7,262	29,060
1,248.70	7,317	29,789
1,248.80	7,372	30,523
1,248.90	7,427	31,263
1,249.00	7,482	32,008
1,249.10	7,536	32,759
1,249.20	7,591	33,516
1,249.30	7,646	34,277
1,249.40	7,701	35,045
1,249.50	7,756	35,818
1,249.60	7,811	36,596
1,249.70	7,866	37,380
1,249.80	7,921	38,169
1,249.90	7,976	38,964
1,250.00	8,031	39,765
1,250.10	8,260	40,579
1,250.20	8,489	41,416
1,250.30	8,718	42,277
1,250.40	8,947	43,160
1,250.50	9,176	44,066
1,250.60	9,404	44,995
1,250.70	9,633	45,947
1,250.80	9,862	46,922
1,250.90	10,091	47,919
1,251.00	**10,320**	**48,940**

Summary for Link 5L:

Inflow Area = 236,966 sf, 0.00% Impervious, Inflow Depth = 0.00" for 25-yr event
Inflow = 0.00 cfs @ 17.55 hrs, Volume= 81 cf
Primary = 0.00 cfs @ 17.55 hrs, Volume= 81 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Link 5L:



Hydrograph for Link 5L:

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00	30.50	0.00	0.00	0.00
5.50	0.00	0.00	0.00	31.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	31.50	0.00	0.00	0.00
6.50	0.00	0.00	0.00	32.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	32.50	0.00	0.00	0.00
7.50	0.00	0.00	0.00	33.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	33.50	0.00	0.00	0.00
8.50	0.00	0.00	0.00	34.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	34.50	0.00	0.00	0.00
9.50	0.00	0.00	0.00	35.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	35.50	0.00	0.00	0.00
10.50	0.00	0.00	0.00	36.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	36.50	0.00	0.00	0.00
11.50	0.00	0.00	0.00	37.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	37.50	0.00	0.00	0.00
12.50	0.00	0.00	0.00	38.00	0.00	0.00	0.00
13.00	0.00	0.00	0.00	38.50	0.00	0.00	0.00
13.50	0.00	0.00	0.00	39.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	39.50	0.00	0.00	0.00
14.50	0.00	0.00	0.00	40.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	40.50	0.00	0.00	0.00
15.50	0.00	0.00	0.00	41.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	41.50	0.00	0.00	0.00
16.50	0.00	0.00	0.00	42.00	0.00	0.00	0.00
17.00	0.00	0.00	0.00	42.50	0.00	0.00	0.00
17.50	**0.00**	0.00	**0.00**	43.00	0.00	0.00	0.00
18.00	**0.00**	0.00	**0.00**	43.50	0.00	0.00	0.00
18.50	0.00	0.00	0.00	44.00	0.00	0.00	0.00
19.00	0.00	0.00	0.00	44.50	0.00	0.00	0.00
19.50	0.00	0.00	0.00	45.00	0.00	0.00	0.00
20.00	0.00	0.00	0.00	45.50	0.00	0.00	0.00
20.50	0.00	0.00	0.00	46.00	0.00	0.00	0.00
21.00	0.00	0.00	0.00	46.50	0.00	0.00	0.00
21.50	0.00	0.00	0.00	47.00	0.00	0.00	0.00
22.00	0.00	0.00	0.00	47.50	0.00	0.00	0.00
22.50	0.00	0.00	0.00	48.00	0.00	0.00	0.00
23.00	0.00	0.00	0.00				
23.50	0.00	0.00	0.00				
24.00	0.00	0.00	0.00				
24.50	0.00	0.00	0.00				
25.00	0.00	0.00	0.00				
25.50	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
26.50	0.00	0.00	0.00				
27.00	0.00	0.00	0.00				
27.50	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
28.50	0.00	0.00	0.00				
29.00	0.00	0.00	0.00				
29.50	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.442 ac 0.00% Impervious Runoff Depth=0.19"
Flow Length=561' Tc=19.7 min CN=33 Runoff=0.03 cfs 984 cf

Subcatchment 6S: DA-2 Runoff Area=5.118 ac 0.00% Impervious Runoff Depth=0.42"
Flow Length=868' Tc=29.6 min CN=38 Runoff=0.63 cfs 7,857 cf

Subcatchment 7S: DA-3 Runoff Area=4.547 ac 0.00% Impervious Runoff Depth=0.23"
Flow Length=822' Tc=41.1 min CN=34 Runoff=0.14 cfs 3,785 cf

Subcatchment 8S: DA-4 Runoff Area=0.322 ac 0.00% Impervious Runoff Depth=0.19"
Flow Length=77' Slope=0.2000 '/' Tc=8.8 min CN=33 Runoff=0.01 cfs 220 cf

Reach 10R: Post w/BMP Inflow=0.19 cfs 4,988 cf
Outflow=0.19 cfs 4,988 cf

Pond 6P: Wet Pond Peak Elev=1,244.94' Storage=7,857 cf Inflow=0.63 cfs 7,857 cf
Outflow=0.00 cfs 0 cf

Link 5L: Inflow=0.01 cfs 220 cf
Primary=0.01 cfs 220 cf

Total Runoff Area = 497,847 sf Runoff Volume = 12,846 cf Average Runoff Depth = 0.31"
100.00% Pervious = 497,847 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

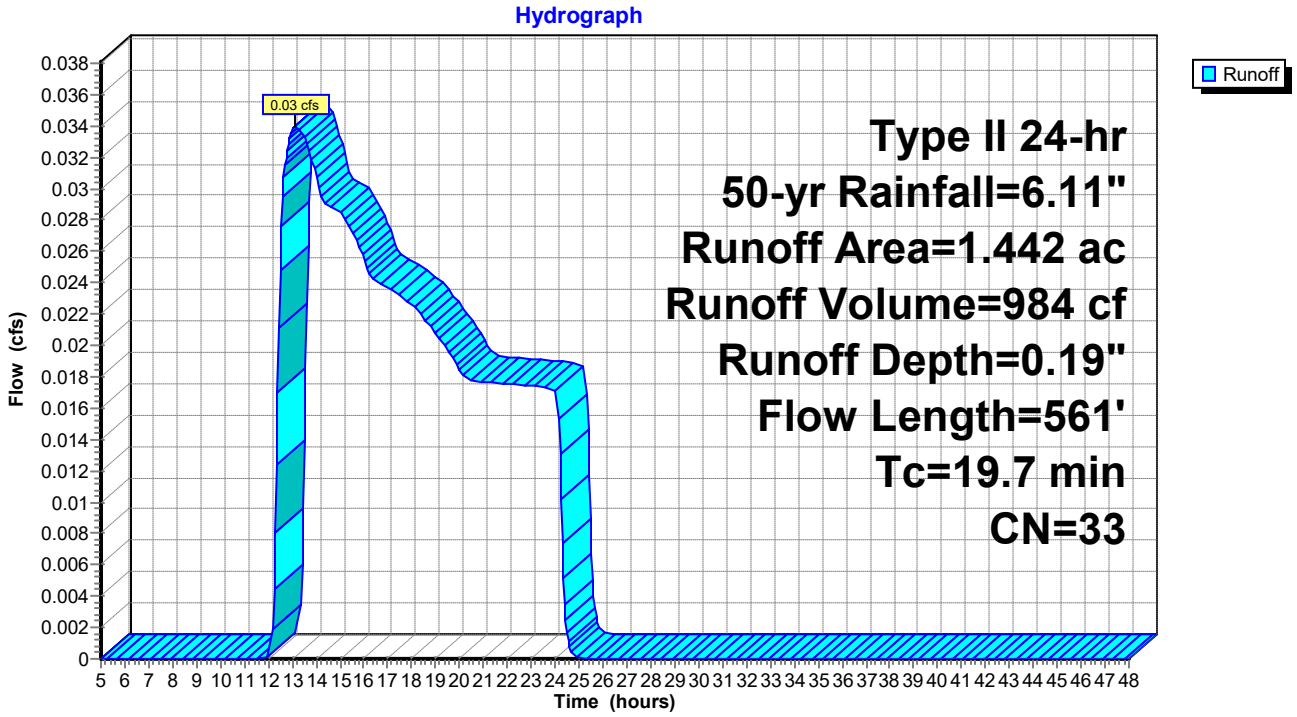
Runoff = 0.03 cfs @ 13.10 hrs, Volume= 984 cf, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.11"

Area (ac)	CN	Description
0.707	36	Woods, Fair, HSG A
0.735	30	Meadow, non-grazed, HSG A
1.442	33	Weighted Average
1.442		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	76	0.1050	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.8	485	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	561	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.38	0.00	0.00
5.50	0.44	0.00	0.00
6.00	0.49	0.00	0.00
6.50	0.55	0.00	0.00
7.00	0.60	0.00	0.00
7.50	0.67	0.00	0.00
8.00	0.73	0.00	0.00
8.50	0.81	0.00	0.00
9.00	0.90	0.00	0.00
9.50	1.00	0.00	0.00
10.00	1.11	0.00	0.00
10.50	1.25	0.00	0.00
11.00	1.44	0.00	0.00
11.50	1.73	0.00	0.00
12.00	4.05	0.00	0.00
12.50	4.49	0.01	0.02
13.00	4.72	0.02	**0.03**
13.50	4.88	0.03	**0.03**
14.00	5.01	0.04	0.03
14.50	5.12	0.05	0.03
15.00	5.21	0.06	0.03
15.50	5.30	0.07	0.03
16.00	5.38	0.08	0.03
16.50	5.45	0.09	0.02
17.00	5.51	0.10	0.02
17.50	5.57	0.10	0.02
18.00	5.63	0.11	0.02
18.50	5.68	0.12	0.02
19.00	5.73	0.13	0.02
19.50	5.78	0.13	0.02
20.00	5.82	0.14	0.02
20.50	5.86	0.15	0.02
21.00	5.89	0.15	0.02
21.50	5.93	0.16	0.02
22.00	5.97	0.16	0.02
22.50	6.01	0.17	0.02
23.00	6.04	0.18	0.02
23.50	6.08	0.18	0.02
24.00	**6.11**	**0.19**	0.02
24.50	6.11	0.19	0.00
25.00	6.11	0.19	0.00
25.50	6.11	0.19	0.00
26.00	6.11	0.19	0.00
26.50	6.11	0.19	0.00
27.00	6.11	0.19	0.00
27.50	6.11	0.19	0.00
28.00	6.11	0.19	0.00
28.50	6.11	0.19	0.00
29.00	6.11	0.19	0.00
29.50	6.11	0.19	0.00
30.00	6.11	0.19	0.00
30.50	6.11	0.19	0.00
31.00	6.11	0.19	0.00
31.50	6.11	0.19	0.00
32.00	6.11	0.19	0.00
32.50	6.11	0.19	0.00
33.00	6.11	0.19	0.00
33.50	6.11	0.19	0.00
34.00	6.11	0.19	0.00
34.50	6.11	0.19	0.00
35.00	6.11	0.19	0.00
35.50	6.11	0.19	0.00
36.00	6.11	0.19	0.00
36.50	6.11	0.19	0.00
37.00	6.11	0.19	0.00
37.50	6.11	0.19	0.00
38.00	6.11	0.19	0.00
38.50	6.11	0.19	0.00
39.00	6.11	0.19	0.00
39.50	6.11	0.19	0.00
40.00	6.11	0.19	0.00
40.50	6.11	0.19	0.00
41.00	6.11	0.19	0.00
41.50	6.11	0.19	0.00
42.00	6.11	0.19	0.00
42.50	6.11	0.19	0.00
43.00	6.11	0.19	0.00
43.50	6.11	0.19	0.00
44.00	6.11	0.19	0.00
44.50	6.11	0.19	0.00
45.00	6.11	0.19	0.00
45.50	6.11	0.19	0.00
46.00	6.11	0.19	0.00
46.50	6.11	0.19	0.00
47.00	6.11	0.19	0.00
47.50	6.11	0.19	0.00
48.00	6.11	0.19	0.00

Summary for Subcatchment 6S: DA-2

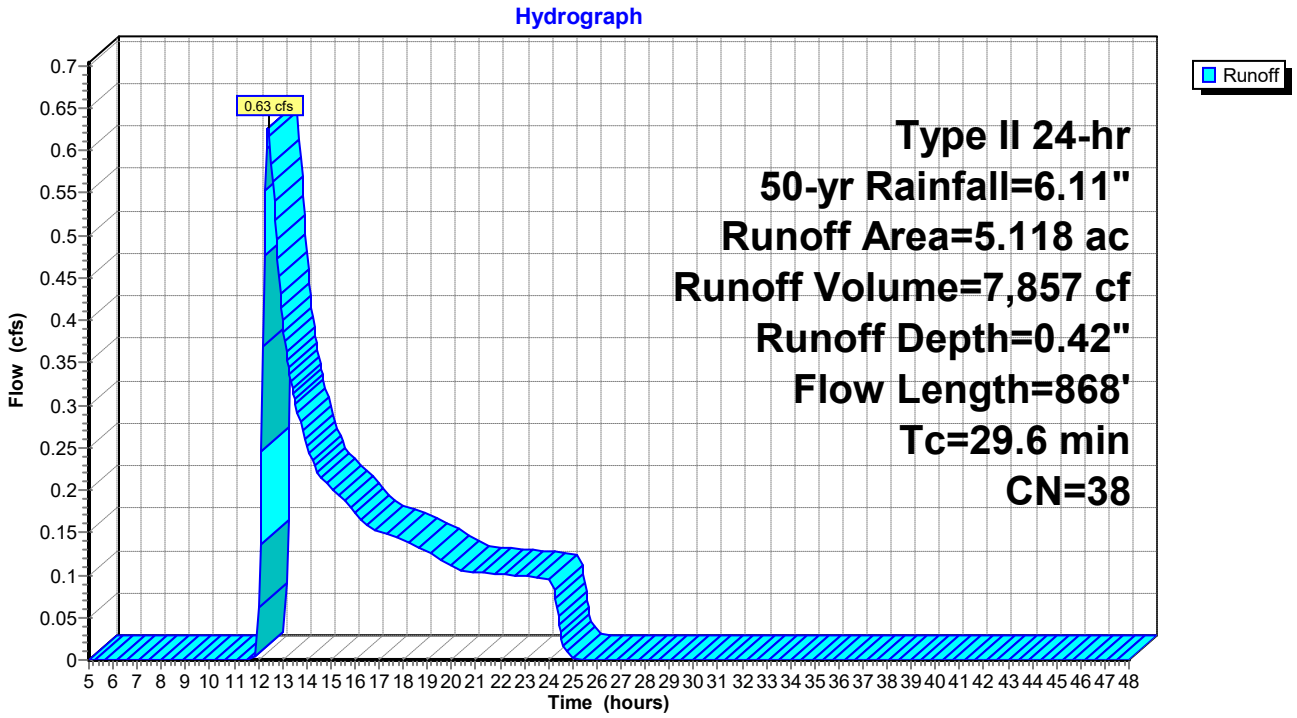
Runoff = 0.63 cfs @ 12.43 hrs, Volume= 7,857 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.11"

	Area (ac)	CN	Description
	3.101	36	Woods, Fair, HSG A
	1.615	30	Meadow, non-grazed, HSG A
*	0.402	89	Gravel area
	5.118	38	Weighted Average
	5.118		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3	80	0.0500	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.5	262	0.0610	1.23		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	122	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	56	0.1070	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	232	0.0520	3.81	6.86	**Channel Flow, Diversion Channel** Area= 1.8 sf Perim= 5.0' r= 0.36' n= 0.045
2.1	116	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.6	868	Total			

Subcatchment 6S: DA-2



Hydrograph for Subcatchment 6S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.38	0.00	0.00
5.50	0.44	0.00	0.00
6.00	0.49	0.00	0.00
6.50	0.55	0.00	0.00
7.00	0.60	0.00	0.00
7.50	0.67	0.00	0.00
8.00	0.73	0.00	0.00
8.50	0.81	0.00	0.00
9.00	0.90	0.00	0.00
9.50	1.00	0.00	0.00
10.00	1.11	0.00	0.00
10.50	1.25	0.00	0.00
11.00	1.44	0.00	0.00
11.50	1.73	0.00	0.00
12.00	4.05	0.04	**0.02**
12.50	4.49	0.09	**0.61**
13.00	4.72	0.12	0.40
13.50	4.88	0.15	0.31
14.00	5.01	0.17	0.25
14.50	5.12	0.19	0.22
15.00	5.21	0.21	0.20
15.50	5.30	0.23	0.19
16.00	5.38	0.24	0.17
16.50	5.45	0.26	0.16
17.00	5.51	0.27	0.15
17.50	5.57	0.29	0.15
18.00	5.63	0.30	0.14
18.50	5.68	0.31	0.13
19.00	5.73	0.32	0.13
19.50	5.78	0.34	0.12
20.00	5.82	0.35	0.11
20.50	5.86	0.36	0.10
21.00	5.89	0.37	0.10
21.50	5.93	0.38	0.10
22.00	5.97	0.39	0.10
22.50	6.01	0.39	0.10
23.00	6.04	0.40	0.10
23.50	6.08	0.41	0.10
24.00	**6.11**	**0.42**	0.10
24.50	6.11	0.42	0.03
25.00	6.11	0.42	0.00
25.50	6.11	0.42	0.00
26.00	6.11	0.42	0.00
26.50	6.11	0.42	0.00
27.00	6.11	0.42	0.00
27.50	6.11	0.42	0.00
28.00	6.11	0.42	0.00
28.50	6.11	0.42	0.00
29.00	6.11	0.42	0.00
29.50	6.11	0.42	0.00
30.00	6.11	0.42	0.00
30.50	6.11	0.42	0.00
31.00	6.11	0.42	0.00
31.50	6.11	0.42	0.00
32.00	6.11	0.42	0.00
32.50	6.11	0.42	0.00
33.00	6.11	0.42	0.00
33.50	6.11	0.42	0.00
34.00	6.11	0.42	0.00
34.50	6.11	0.42	0.00
35.00	6.11	0.42	0.00
35.50	6.11	0.42	0.00
36.00	6.11	0.42	0.00
36.50	6.11	0.42	0.00
37.00	6.11	0.42	0.00
37.50	6.11	0.42	0.00
38.00	6.11	0.42	0.00
38.50	6.11	0.42	0.00
39.00	6.11	0.42	0.00
39.50	6.11	0.42	0.00
40.00	6.11	0.42	0.00
40.50	6.11	0.42	0.00
41.00	6.11	0.42	0.00
41.50	6.11	0.42	0.00
42.00	6.11	0.42	0.00
42.50	6.11	0.42	0.00
43.00	6.11	0.42	0.00
43.50	6.11	0.42	0.00
44.00	6.11	0.42	0.00
44.50	6.11	0.42	0.00
45.00	6.11	0.42	0.00
45.50	6.11	0.42	0.00
46.00	6.11	0.42	0.00
46.50	6.11	0.42	0.00
47.00	6.11	0.42	0.00
47.50	6.11	0.42	0.00
48.00	6.11	0.42	0.00

Summary for Subcatchment 7S: DA-3

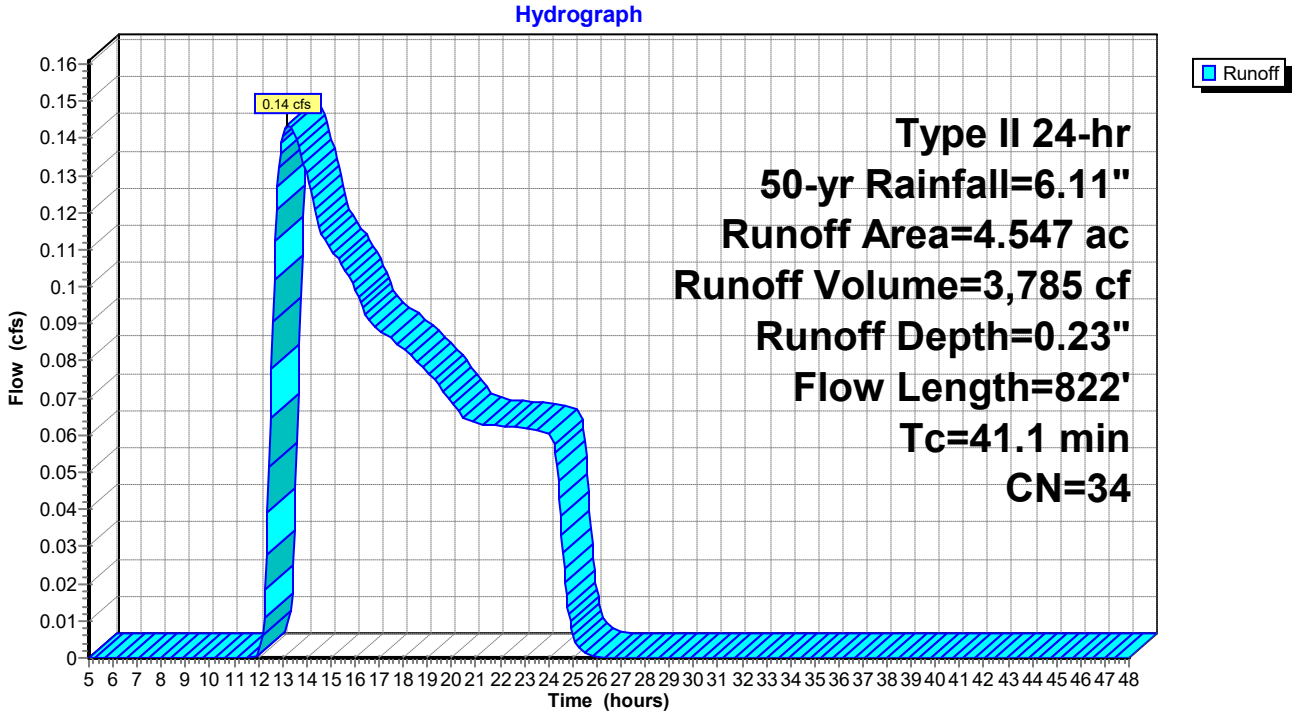
Runoff = 0.14 cfs @ 13.21 hrs, Volume= 3,785 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.11"

Area (ac)	CN	Description
3.255	36	Woods, Fair, HSG A
1.292	30	Meadow, non-grazed, HSG A
4.547	34	Weighted Average
4.547		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.6	98	0.0250	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
5.8	592	0.1140	1.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	132	0.1780	2.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
41.1	822	Total			

Subcatchment 7S: DA-3



Hydrograph for Subcatchment 7S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.38	0.00	0.00	30.50	6.11	0.23	0.00
5.50	0.44	0.00	0.00	31.00	6.11	0.23	0.00
6.00	0.49	0.00	0.00	31.50	6.11	0.23	0.00
6.50	0.55	0.00	0.00	32.00	6.11	0.23	0.00
7.00	0.60	0.00	0.00	32.50	6.11	0.23	0.00
7.50	0.67	0.00	0.00	33.00	6.11	0.23	0.00
8.00	0.73	0.00	0.00	33.50	6.11	0.23	0.00
8.50	0.81	0.00	0.00	34.00	6.11	0.23	0.00
9.00	0.90	0.00	0.00	34.50	6.11	0.23	0.00
9.50	1.00	0.00	0.00	35.00	6.11	0.23	0.00
10.00	1.11	0.00	0.00	35.50	6.11	0.23	0.00
10.50	1.25	0.00	0.00	36.00	6.11	0.23	0.00
11.00	1.44	0.00	0.00	36.50	6.11	0.23	0.00
11.50	1.73	0.00	0.00	37.00	6.11	0.23	0.00
12.00	4.05	0.00	0.00	37.50	6.11	0.23	0.00
12.50	4.49	0.02	0.06	38.00	6.11	0.23	0.00
13.00	4.72	0.03	**0.14**	38.50	6.11	0.23	0.00
13.50	4.88	0.05	**0.14**	39.00	6.11	0.23	0.00
14.00	5.01	0.06	0.13	39.50	6.11	0.23	0.00
14.50	5.12	0.07	0.12	40.00	6.11	0.23	0.00
15.00	5.21	0.09	0.11	40.50	6.11	0.23	0.00
15.50	5.30	0.10	0.11	41.00	6.11	0.23	0.00
16.00	5.38	0.11	0.10	41.50	6.11	0.23	0.00
16.50	5.45	0.12	0.09	42.00	6.11	0.23	0.00
17.00	5.51	0.13	0.09	42.50	6.11	0.23	0.00
17.50	5.57	0.14	0.09	43.00	6.11	0.23	0.00
18.00	5.63	0.14	0.08	43.50	6.11	0.23	0.00
18.50	5.68	0.15	0.08	44.00	6.11	0.23	0.00
19.00	5.73	0.16	0.08	44.50	6.11	0.23	0.00
19.50	5.78	0.17	0.07	45.00	6.11	0.23	0.00
20.00	5.82	0.18	0.07	45.50	6.11	0.23	0.00
20.50	5.86	0.18	0.06	46.00	6.11	0.23	0.00
21.00	5.89	0.19	0.06	46.50	6.11	0.23	0.00
21.50	5.93	0.20	0.06	47.00	6.11	0.23	0.00
22.00	5.97	0.20	0.06	47.50	6.11	0.23	0.00
22.50	6.01	0.21	0.06	48.00	6.11	0.23	0.00
23.00	6.04	0.22	0.06				
23.50	6.08	0.22	0.06				
24.00	**6.11**	**0.23**	0.06				
24.50	6.11	0.23	0.04				
25.00	6.11	0.23	0.01				
25.50	6.11	0.23	0.00				
26.00	6.11	0.23	0.00				
26.50	6.11	0.23	0.00				
27.00	6.11	0.23	0.00				
27.50	6.11	0.23	0.00				
28.00	6.11	0.23	0.00				
28.50	6.11	0.23	0.00				
29.00	6.11	0.23	0.00				
29.50	6.11	0.23	0.00				
30.00	6.11	0.23	0.00				

Summary for Subcatchment 8S: DA-4

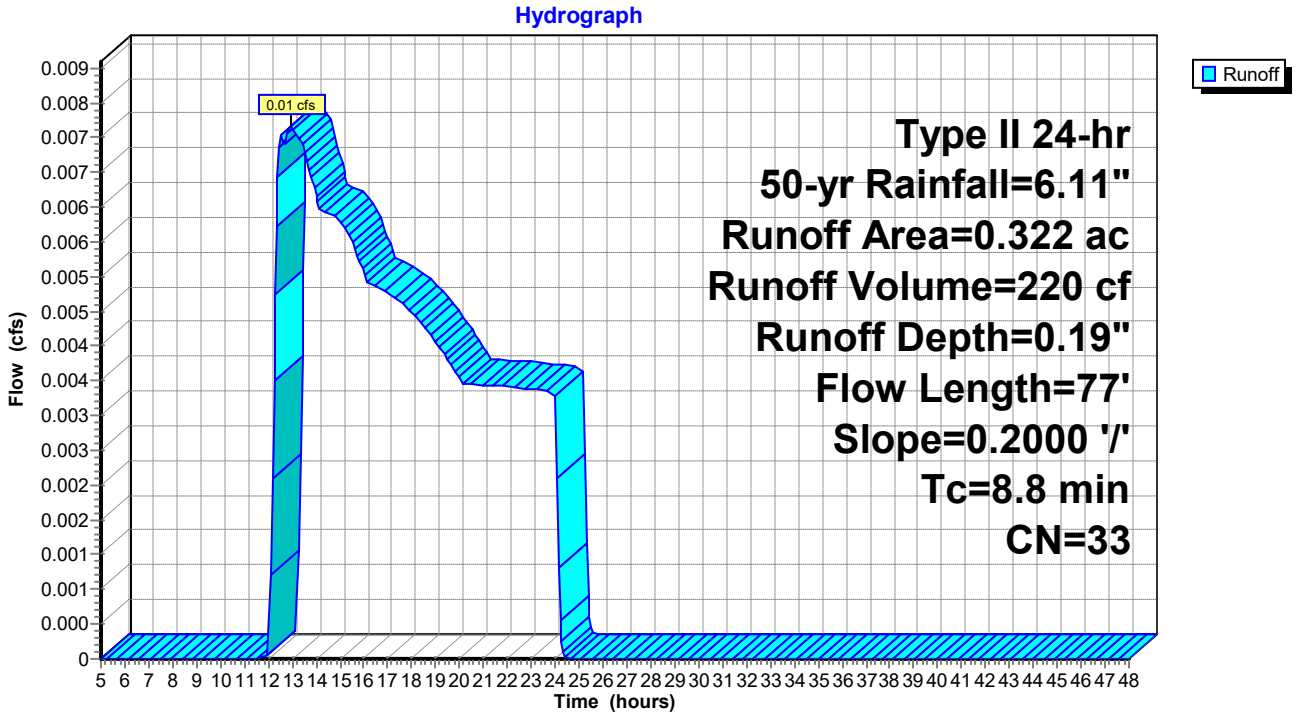
Runoff = 0.01 cfs @ 12.93 hrs, Volume= 220 cf, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.11"

Area (ac)	CN	Description
0.143	36	Woods, Fair, HSG A
0.179	30	Meadow, non-grazed, HSG A
0.322	33	Weighted Average
0.322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	40	0.2000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.03"
6.9	37	0.2000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
8.8	77	Total			

Subcatchment 8S: DA-4



Hydrograph for Subcatchment 8S: DA-4

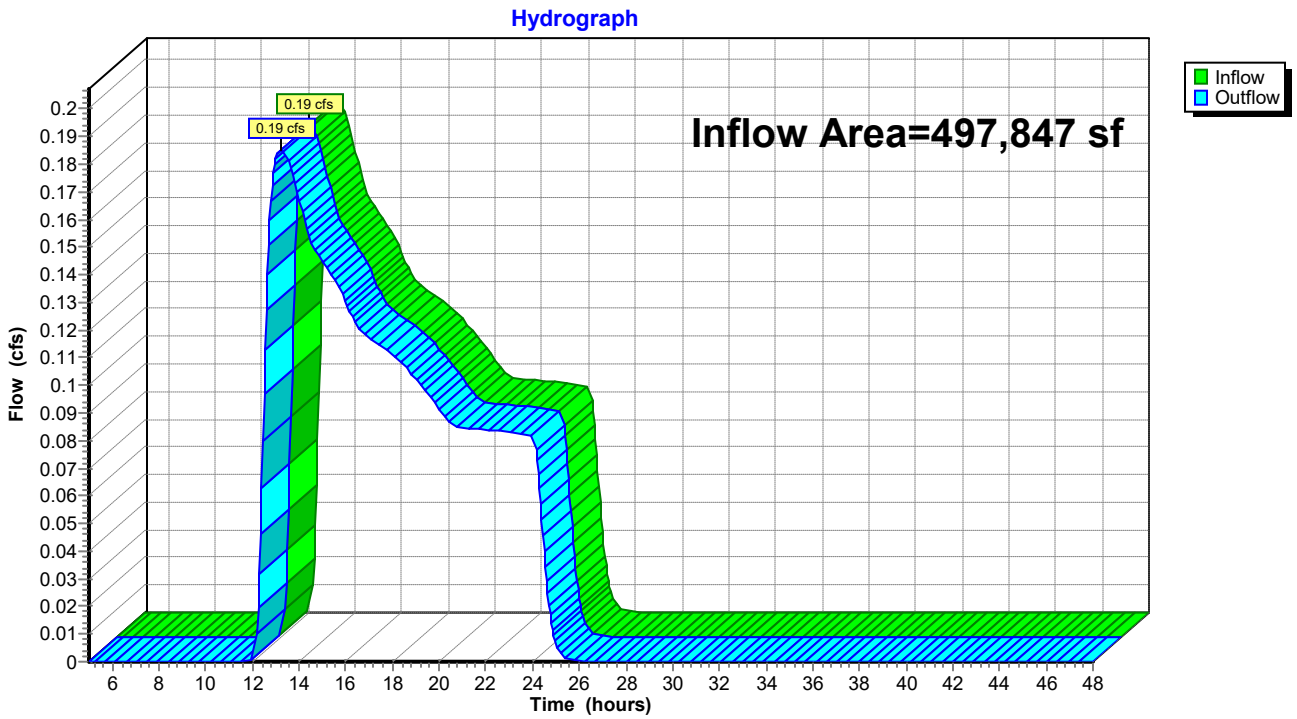
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.38	0.00	0.00
5.50	0.44	0.00	0.00
6.00	0.49	0.00	0.00
6.50	0.55	0.00	0.00
7.00	0.60	0.00	0.00
7.50	0.67	0.00	0.00
8.00	0.73	0.00	0.00
8.50	0.81	0.00	0.00
9.00	0.90	0.00	0.00
9.50	1.00	0.00	0.00
10.00	1.11	0.00	0.00
10.50	1.25	0.00	0.00
11.00	1.44	0.00	0.00
11.50	1.73	0.00	0.00
12.00	4.05	0.00	0.00
12.50	4.49	0.01	**0.01**
13.00	4.72	0.02	**0.01**
13.50	4.88	0.03	0.01
14.00	5.01	0.04	0.01
14.50	5.12	0.05	0.01
15.00	5.21	0.06	0.01
15.50	5.30	0.07	0.01
16.00	5.38	0.08	0.01
16.50	5.45	0.09	0.01
17.00	5.51	0.10	0.01
17.50	5.57	0.10	0.01
18.00	5.63	0.11	0.00
18.50	5.68	0.12	0.00
19.00	5.73	0.13	0.00
19.50	5.78	0.13	0.00
20.00	5.82	0.14	0.00
20.50	5.86	0.15	0.00
21.00	5.89	0.15	0.00
21.50	5.93	0.16	0.00
22.00	5.97	0.16	0.00
22.50	6.01	0.17	0.00
23.00	6.04	0.18	0.00
23.50	6.08	0.18	0.00
24.00	**6.11**	**0.19**	0.00
24.50	6.11	0.19	0.00
25.00	6.11	0.19	0.00
25.50	6.11	0.19	0.00
26.00	6.11	0.19	0.00
26.50	6.11	0.19	0.00
27.00	6.11	0.19	0.00
27.50	6.11	0.19	0.00
28.00	6.11	0.19	0.00
28.50	6.11	0.19	0.00
29.00	6.11	0.19	0.00
29.50	6.11	0.19	0.00
30.00	6.11	0.19	0.00
30.50	6.11	0.19	0.00
31.00	6.11	0.19	0.00
31.50	6.11	0.19	0.00
32.00	6.11	0.19	0.00
32.50	6.11	0.19	0.00
33.00	6.11	0.19	0.00
33.50	6.11	0.19	0.00
34.00	6.11	0.19	0.00
34.50	6.11	0.19	0.00
35.00	6.11	0.19	0.00
35.50	6.11	0.19	0.00
36.00	6.11	0.19	0.00
36.50	6.11	0.19	0.00
37.00	6.11	0.19	0.00
37.50	6.11	0.19	0.00
38.00	6.11	0.19	0.00
38.50	6.11	0.19	0.00
39.00	6.11	0.19	0.00
39.50	6.11	0.19	0.00
40.00	6.11	0.19	0.00
40.50	6.11	0.19	0.00
41.00	6.11	0.19	0.00
41.50	6.11	0.19	0.00
42.00	6.11	0.19	0.00
42.50	6.11	0.19	0.00
43.00	6.11	0.19	0.00
43.50	6.11	0.19	0.00
44.00	6.11	0.19	0.00
44.50	6.11	0.19	0.00
45.00	6.11	0.19	0.00
45.50	6.11	0.19	0.00
46.00	6.11	0.19	0.00
46.50	6.11	0.19	0.00
47.00	6.11	0.19	0.00
47.50	6.11	0.19	0.00
48.00	6.11	0.19	0.00

Summary for Reach 10R: Post w/BMP

Inflow Area = 497,847 sf, 0.00% Impervious, Inflow Depth = 0.12" for 50-yr event
Inflow = 0.19 cfs @ 13.20 hrs, Volume= 4,988 cf
Outflow = 0.19 cfs @ 13.20 hrs, Volume= 4,988 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/BMP



Hydrograph for Reach 10R: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	30.50	0.00		0.00
5.50	0.00		0.00	31.00	0.00		0.00
6.00	0.00		0.00	31.50	0.00		0.00
6.50	0.00		0.00	32.00	0.00		0.00
7.00	0.00		0.00	32.50	0.00		0.00
7.50	0.00		0.00	33.00	0.00		0.00
8.00	0.00		0.00	33.50	0.00		0.00
8.50	0.00		0.00	34.00	0.00		0.00
9.00	0.00		0.00	34.50	0.00		0.00
9.50	0.00		0.00	35.00	0.00		0.00
10.00	0.00		0.00	35.50	0.00		0.00
10.50	0.00		0.00	36.00	0.00		0.00
11.00	0.00		0.00	36.50	0.00		0.00
11.50	0.00		0.00	37.00	0.00		0.00
12.00	0.00		0.00	37.50	0.00		0.00
12.50	0.10		0.10	38.00	0.00		0.00
13.00	**0.18**		**0.18**	38.50	0.00		0.00
13.50	**0.18**		**0.18**	39.00	0.00		0.00
14.00	0.17		0.17	39.50	0.00		0.00
14.50	0.15		0.15	40.00	0.00		0.00
15.00	0.14		0.14	40.50	0.00		0.00
15.50	0.14		0.14	41.00	0.00		0.00
16.00	0.13		0.13	41.50	0.00		0.00
16.50	0.12		0.12	42.00	0.00		0.00
17.00	0.12		0.12	42.50	0.00		0.00
17.50	0.11		0.11	43.00	0.00		0.00
18.00	0.11		0.11	43.50	0.00		0.00
18.50	0.11		0.11	44.00	0.00		0.00
19.00	0.10		0.10	44.50	0.00		0.00
19.50	0.10		0.10	45.00	0.00		0.00
20.00	0.09		0.09	45.50	0.00		0.00
20.50	0.09		0.09	46.00	0.00		0.00
21.00	0.08		0.08	46.50	0.00		0.00
21.50	0.08		0.08	47.00	0.00		0.00
22.00	0.08		0.08	47.50	0.00		0.00
22.50	0.08		0.08	48.00	0.00		0.00
23.00	0.08		0.08				
23.50	0.08		0.08				
24.00	0.08		0.08				
24.50	0.04		0.04				
25.00	0.01		0.01				
25.50	0.00		0.00				
26.00	0.00		0.00				
26.50	0.00		0.00				
27.00	0.00		0.00				
27.50	0.00		0.00				
28.00	0.00		0.00				
28.50	0.00		0.00				
29.00	0.00		0.00				
29.50	0.00		0.00				
30.00	0.00		0.00				

Summary for Pond 6P: Wet Pond

Inflow Area = 222,940 sf, 0.00% Impervious, Inflow Depth = 0.42" for 50-yr event
Inflow = 0.63 cfs @ 12.43 hrs, Volume= 7,857 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,244.94' @ 25.70 hrs Surf.Area= 4,201 sf Storage= 7,857 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

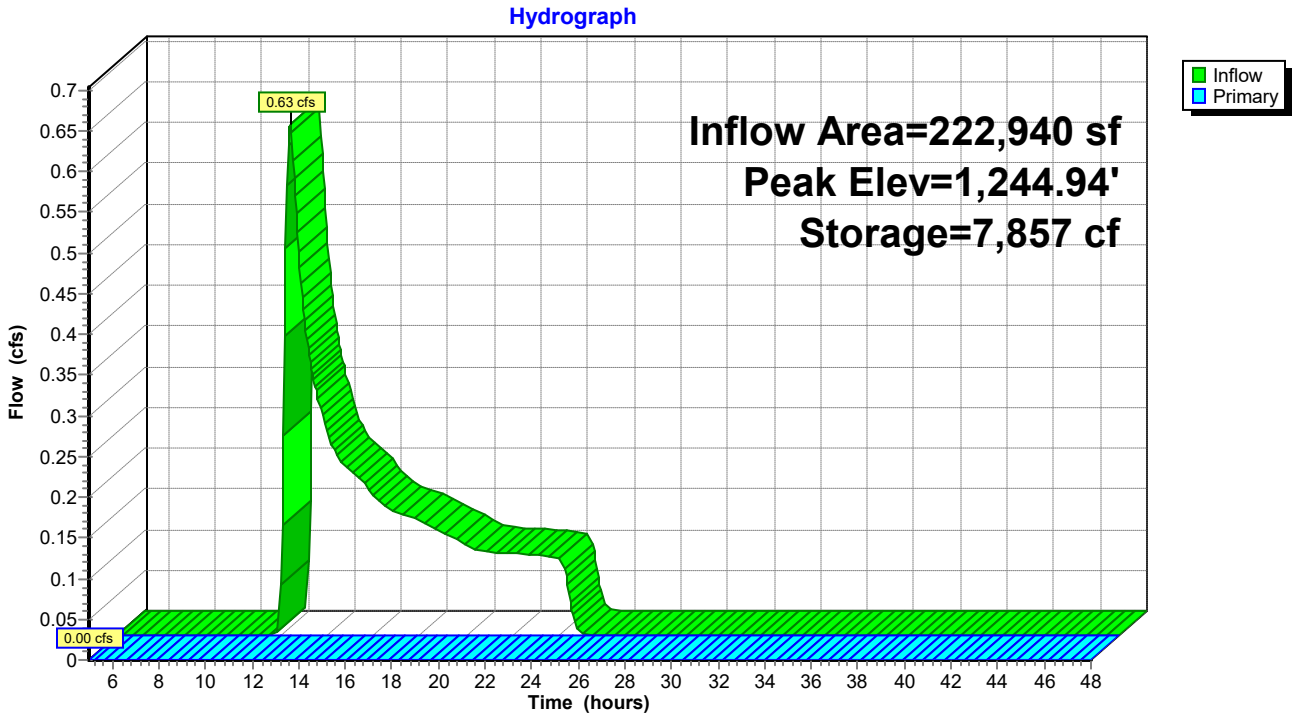
Volume	Invert	Avail.Storage	Storage Description
#1	1,242.50'	48,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,242.50	2,285	0	0
1,244.00	3,425	4,283	4,283
1,246.00	5,081	8,506	12,789
1,248.00	6,932	12,013	24,802
1,250.00	8,031	14,963	39,765
1,251.00	10,320	9,176	48,940

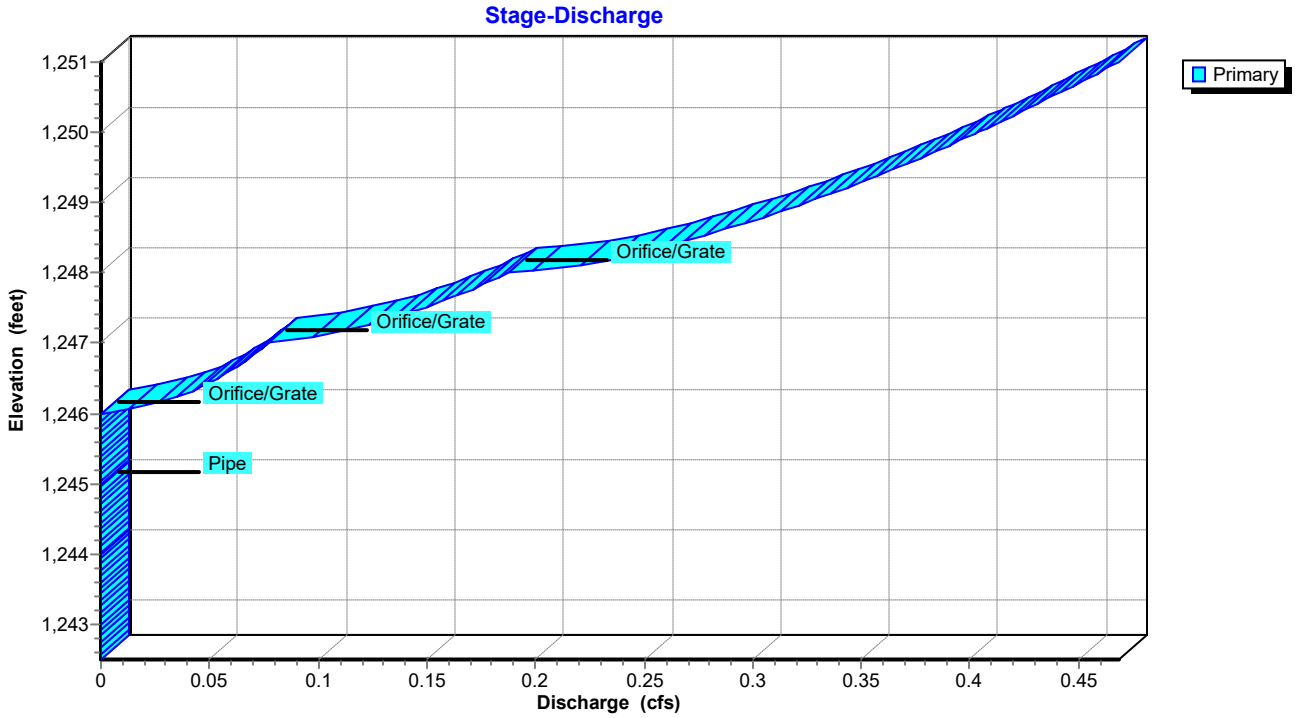
Device	Routing	Invert	Outlet Devices
#1	Primary	1,245.00'	**15.0" Round Pipe** L= 100.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,245.00' / 1,243.00' S= 0.0200 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	1,246.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	1,247.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,248.00'	**1.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,242.50' (Free Discharge)
└─**1=Pipe** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Wet Pond



Pond 6P: Wet Pond



Hydrograph for Pond 6P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	1,242.50	**0.00**
6.00	0.00	0	1,242.50	0.00
7.00	0.00	0	1,242.50	0.00
8.00	0.00	0	1,242.50	0.00
9.00	0.00	0	1,242.50	0.00
10.00	0.00	0	1,242.50	0.00
11.00	0.00	0	1,242.50	0.00
12.00	**0.02**	2	1,242.50	0.00
13.00	**0.40**	1,619	1,243.14	0.00
14.00	0.25	2,745	1,243.53	0.00
15.00	0.20	3,546	1,243.78	0.00
16.00	0.17	4,228	1,243.98	0.00
17.00	0.15	4,804	1,244.15	0.00
18.00	0.14	5,331	1,244.30	0.00
19.00	0.13	5,813	1,244.42	0.00
20.00	0.11	6,242	1,244.54	0.00
21.00	0.10	6,621	1,244.63	0.00
22.00	0.10	6,988	1,244.73	0.00
23.00	0.10	7,347	1,244.81	0.00
24.00	0.10	7,699	1,244.90	0.00
25.00	0.00	**7,856**	**1,244.94**	0.00
26.00	0.00	**7,857**	**1,244.94**	0.00
27.00	0.00	7,857	1,244.94	0.00
28.00	0.00	7,857	1,244.94	0.00
29.00	0.00	7,857	1,244.94	0.00
30.00	0.00	7,857	1,244.94	0.00
31.00	0.00	7,857	1,244.94	0.00
32.00	0.00	7,857	1,244.94	0.00
33.00	0.00	7,857	1,244.94	0.00
34.00	0.00	7,857	1,244.94	0.00
35.00	0.00	7,857	1,244.94	0.00
36.00	0.00	7,857	1,244.94	0.00
37.00	0.00	7,857	1,244.94	0.00
38.00	0.00	7,857	1,244.94	0.00
39.00	0.00	7,857	1,244.94	0.00
40.00	0.00	7,857	1,244.94	0.00
41.00	0.00	7,857	1,244.94	0.00
42.00	0.00	7,857	1,244.94	0.00
43.00	0.00	7,857	1,244.94	0.00
44.00	0.00	7,857	1,244.94	0.00
45.00	0.00	7,857	1,244.94	0.00
46.00	0.00	7,857	1,244.94	0.00
47.00	0.00	7,857	1,244.94	0.00
48.00	0.00	7,857	1,244.94	0.00

Stage-Discharge for Pond 6P: Wet Pond

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,242.50	0.00	1,247.60	0.16
1,242.60	0.00	1,247.70	0.17
1,242.70	0.00	1,247.80	0.17
1,242.80	0.00	1,247.90	0.18
1,242.90	0.00	1,248.00	0.19
1,243.00	0.00	1,248.10	0.22
1,243.10	0.00	1,248.20	0.24
1,243.20	0.00	1,248.30	0.25
1,243.30	0.00	1,248.40	0.26
1,243.40	0.00	1,248.50	0.27
1,243.50	0.00	1,248.60	0.29
1,243.60	0.00	1,248.70	0.30
1,243.70	0.00	1,248.80	0.31
1,243.80	0.00	1,248.90	0.32
1,243.90	0.00	1,249.00	0.32
1,244.00	0.00	1,249.10	0.33
1,244.10	0.00	1,249.20	0.34
1,244.20	0.00	1,249.30	0.35
1,244.30	0.00	1,249.40	0.36
1,244.40	0.00	1,249.50	0.37
1,244.50	0.00	1,249.60	0.37
1,244.60	0.00	1,249.70	0.38
1,244.70	0.00	1,249.80	0.39
1,244.80	0.00	1,249.90	0.40
1,244.90	0.00	1,250.00	0.40
1,245.00	0.00	1,250.10	0.41
1,245.10	0.00	1,250.20	0.42
1,245.20	0.00	1,250.30	0.42
1,245.30	0.00	1,250.40	0.43
1,245.40	0.00	1,250.50	0.44
1,245.50	0.00	1,250.60	0.44
1,245.60	0.00	1,250.70	0.45
1,245.70	0.00	1,250.80	0.46
1,245.80	0.00	1,250.90	0.46
1,245.90	0.00	1,251.00	**0.47**
1,246.00	0.00		
1,246.10	0.02		
1,246.20	0.03		
1,246.30	0.04		
1,246.40	0.05		
1,246.50	0.05		
1,246.60	0.06		
1,246.70	0.06		
1,246.80	0.07		
1,246.90	0.07		
1,247.00	0.08		
1,247.10	0.10		
1,247.20	0.12		
1,247.30	0.13		
1,247.40	0.14		
1,247.50	0.15		

Stage-Area-Storage for Pond 6P: Wet Pond

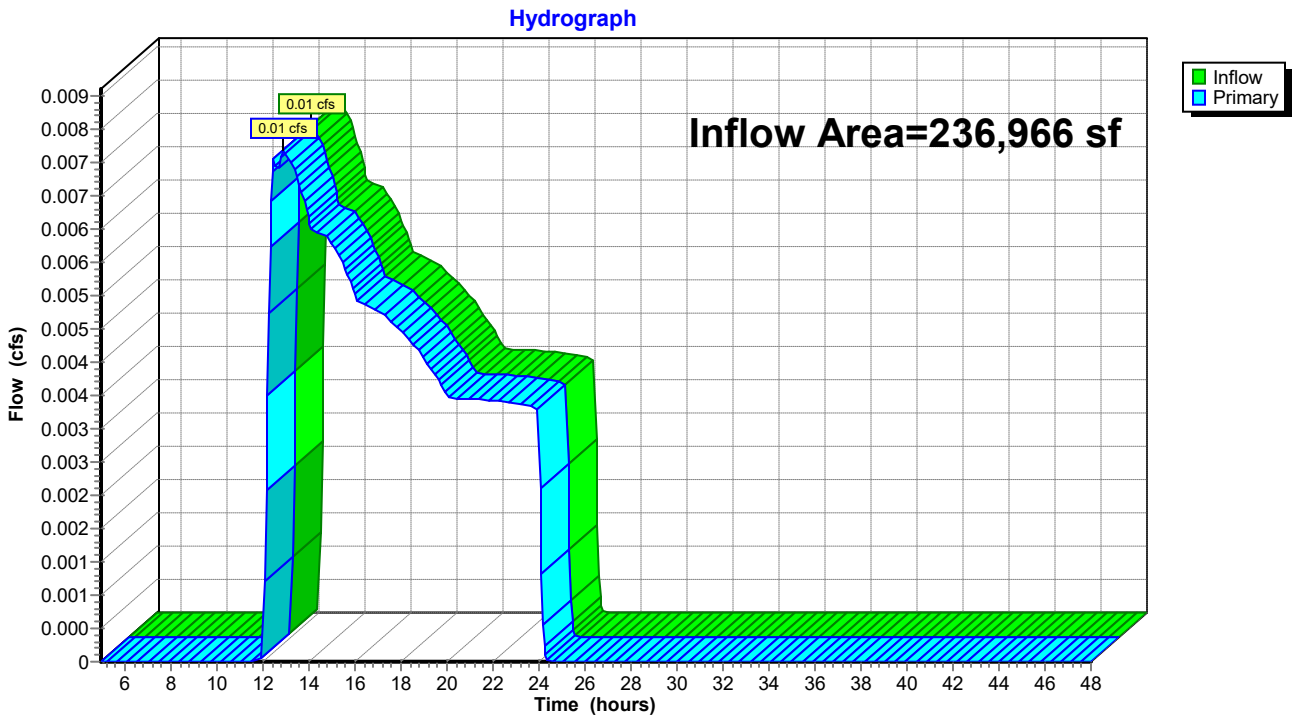
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,242.50	2,285	0
1,242.60	2,361	232
1,242.70	2,437	472
1,242.80	2,513	720
1,242.90	2,589	975
1,243.00	2,665	1,238
1,243.10	2,741	1,508
1,243.20	2,817	1,786
1,243.30	2,893	2,071
1,243.40	2,969	2,364
1,243.50	3,045	2,665
1,243.60	3,121	2,973
1,243.70	3,197	3,289
1,243.80	3,273	3,613
1,243.90	3,349	3,944
1,244.00	3,425	4,283
1,244.10	3,508	4,629
1,244.20	3,591	4,984
1,244.30	3,673	5,347
1,244.40	3,756	5,719
1,244.50	3,839	6,099
1,244.60	3,922	6,487
1,244.70	4,005	6,883
1,244.80	4,087	7,287
1,244.90	4,170	7,700
1,245.00	4,253	8,122
1,245.10	4,336	8,551
1,245.20	4,419	8,989
1,245.30	4,501	9,435
1,245.40	4,584	9,889
1,245.50	4,667	10,352
1,245.60	4,750	10,822
1,245.70	4,833	11,301
1,245.80	4,915	11,789
1,245.90	4,998	12,285
1,246.00	5,081	12,789
1,246.10	5,174	13,301
1,246.20	5,266	13,823
1,246.30	5,359	14,354
1,246.40	5,451	14,895
1,246.50	5,544	15,445
1,246.60	5,636	16,004
1,246.70	5,729	16,572
1,246.80	5,821	17,149
1,246.90	5,914	17,736
1,247.00	6,007	18,332
1,247.10	6,099	18,938
1,247.20	6,192	19,552
1,247.30	6,284	20,176
1,247.40	6,377	20,809
1,247.50	6,469	21,451
1,247.60	6,562	22,103
1,247.70	6,654	22,764
1,247.80	6,747	23,434
1,247.90	6,839	24,113
1,248.00	6,932	24,802
1,248.10	6,987	25,497
1,248.20	7,042	26,199
1,248.30	7,097	26,906
1,248.40	7,152	27,618
1,248.50	7,207	28,336
1,248.60	7,262	29,060
1,248.70	7,317	29,789
1,248.80	7,372	30,523
1,248.90	7,427	31,263
1,249.00	7,482	32,008
1,249.10	7,536	32,759
1,249.20	7,591	33,516
1,249.30	7,646	34,277
1,249.40	7,701	35,045
1,249.50	7,756	35,818
1,249.60	7,811	36,596
1,249.70	7,866	37,380
1,249.80	7,921	38,169
1,249.90	7,976	38,964
1,250.00	8,031	39,765
1,250.10	8,260	40,579
1,250.20	8,489	41,416
1,250.30	8,718	42,277
1,250.40	8,947	43,160
1,250.50	9,176	44,066
1,250.60	9,404	44,995
1,250.70	9,633	45,947
1,250.80	9,862	46,922
1,250.90	10,091	47,919
1,251.00	**10,320**	**48,940**

Summary for Link 5L:

Inflow Area = 236,966 sf, 0.00% Impervious, Inflow Depth = 0.01" for 50-yr event
Inflow = 0.01 cfs @ 12.93 hrs, Volume= 220 cf
Primary = 0.01 cfs @ 12.93 hrs, Volume= 220 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Link 5L:



Hydrograph for Link 5L:

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00	30.50	0.00	0.00	0.00
5.50	0.00	0.00	0.00	31.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	31.50	0.00	0.00	0.00
6.50	0.00	0.00	0.00	32.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	32.50	0.00	0.00	0.00
7.50	0.00	0.00	0.00	33.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	33.50	0.00	0.00	0.00
8.50	0.00	0.00	0.00	34.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	34.50	0.00	0.00	0.00
9.50	0.00	0.00	0.00	35.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	35.50	0.00	0.00	0.00
10.50	0.00	0.00	0.00	36.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	36.50	0.00	0.00	0.00
11.50	0.00	0.00	0.00	37.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	37.50	0.00	0.00	0.00
12.50	**0.01**	0.00	**0.01**	38.00	0.00	0.00	0.00
13.00	**0.01**	0.00	**0.01**	38.50	0.00	0.00	0.00
13.50	0.01	0.00	0.01	39.00	0.00	0.00	0.00
14.00	0.01	0.00	0.01	39.50	0.00	0.00	0.00
14.50	0.01	0.00	0.01	40.00	0.00	0.00	0.00
15.00	0.01	0.00	0.01	40.50	0.00	0.00	0.00
15.50	0.01	0.00	0.01	41.00	0.00	0.00	0.00
16.00	0.01	0.00	0.01	41.50	0.00	0.00	0.00
16.50	0.01	0.00	0.01	42.00	0.00	0.00	0.00
17.00	0.01	0.00	0.01	42.50	0.00	0.00	0.00
17.50	0.01	0.00	0.01	43.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00	43.50	0.00	0.00	0.00
18.50	0.00	0.00	0.00	44.00	0.00	0.00	0.00
19.00	0.00	0.00	0.00	44.50	0.00	0.00	0.00
19.50	0.00	0.00	0.00	45.00	0.00	0.00	0.00
20.00	0.00	0.00	0.00	45.50	0.00	0.00	0.00
20.50	0.00	0.00	0.00	46.00	0.00	0.00	0.00
21.00	0.00	0.00	0.00	46.50	0.00	0.00	0.00
21.50	0.00	0.00	0.00	47.00	0.00	0.00	0.00
22.00	0.00	0.00	0.00	47.50	0.00	0.00	0.00
22.50	0.00	0.00	0.00	48.00	0.00	0.00	0.00
23.00	0.00	0.00	0.00				
23.50	0.00	0.00	0.00				
24.00	0.00	0.00	0.00				
24.50	0.00	0.00	0.00				
25.00	0.00	0.00	0.00				
25.50	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
26.50	0.00	0.00	0.00				
27.00	0.00	0.00	0.00				
27.50	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
28.50	0.00	0.00	0.00				
29.00	0.00	0.00	0.00				
29.50	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: DA-1 Runoff Area=1.442 ac 0.00% Impervious Runoff Depth=0.39"
Flow Length=561' Tc=19.7 min CN=33 Runoff=0.14 cfs 2,046 cf

Subcatchment 6S: DA-2 Runoff Area=5.118 ac 0.00% Impervious Runoff Depth=0.72"
Flow Length=868' Tc=29.6 min CN=38 Runoff=1.62 cfs 13,444 cf

Subcatchment 7S: DA-3 Runoff Area=4.547 ac 0.00% Impervious Runoff Depth=0.45"
Flow Length=822' Tc=41.1 min CN=34 Runoff=0.47 cfs 7,465 cf

Subcatchment 8S: DA-4 Runoff Area=0.322 ac 0.00% Impervious Runoff Depth=0.39"
Flow Length=77' Slope=0.2000 '/' Tc=8.8 min CN=33 Runoff=0.04 cfs 457 cf

Reach 10R: Post w/BMP Inflow=0.61 cfs 10,596 cf
Outflow=0.61 cfs 10,596 cf

Pond 6P: Wet Pond Peak Elev=1,246.11' Storage=13,362 cf Inflow=1.62 cfs 13,444 cf
Outflow=0.02 cfs 628 cf

Link 5L: Inflow=0.04 cfs 1,085 cf
Primary=0.04 cfs 1,085 cf

Total Runoff Area = 497,847 sf Runoff Volume = 23,411 cf Average Runoff Depth = 0.56"
100.00% Pervious = 497,847 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 5S: DA-1

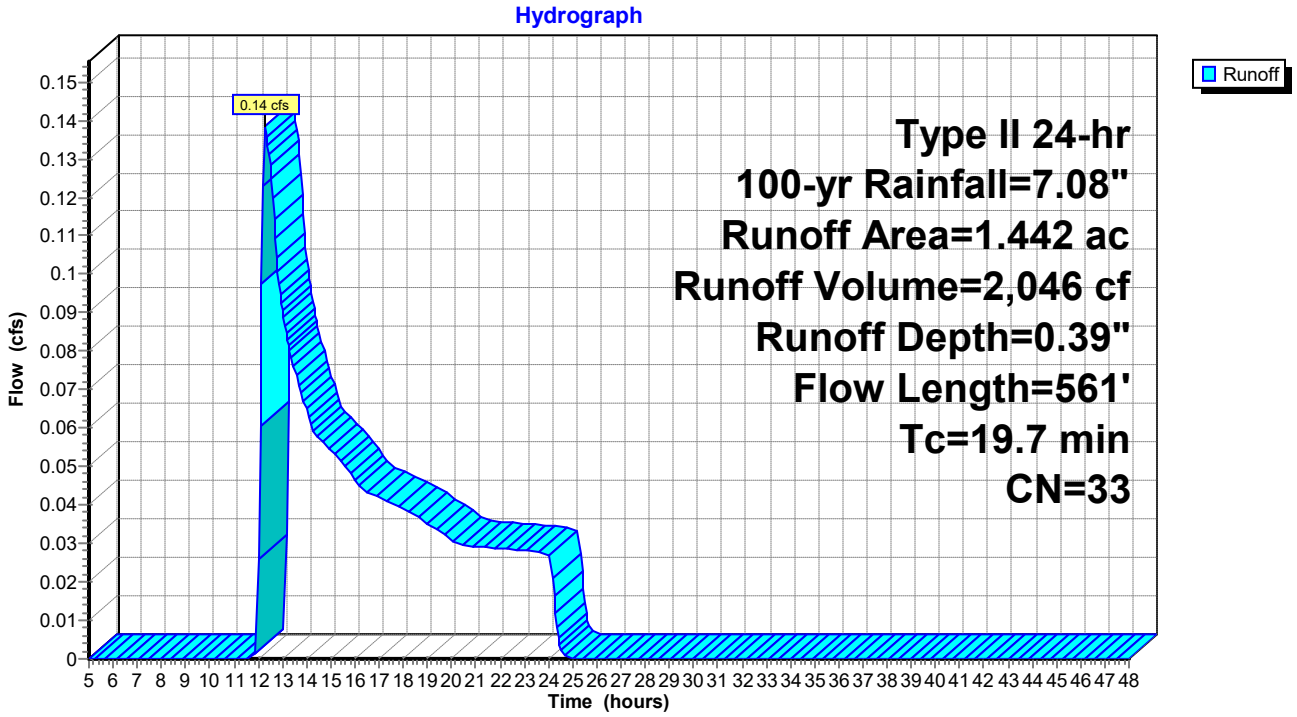
Runoff = 0.14 cfs @ 12.30 hrs, Volume= 2,046 cf, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.08"

Area (ac)	CN	Description
0.707	36	Woods, Fair, HSG A
0.735	30	Meadow, non-grazed, HSG A
1.442	33	Weighted Average
1.442		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	76	0.1050	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.8	485	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	561	Total			

Subcatchment 5S: DA-1



Hydrograph for Subcatchment 5S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.45	0.00	0.00
5.50	0.50	0.00	0.00
6.00	0.57	0.00	0.00
6.50	0.63	0.00	0.00
7.00	0.70	0.00	0.00
7.50	0.77	0.00	0.00
8.00	0.85	0.00	0.00
8.50	0.94	0.00	0.00
9.00	1.04	0.00	0.00
9.50	1.15	0.00	0.00
10.00	1.28	0.00	0.00
10.50	1.44	0.00	0.00
11.00	1.66	0.00	0.00
11.50	2.00	0.00	0.00
12.00	4.69	0.02	**0.01**
12.50	5.20	0.06	**0.13**
13.00	5.47	0.09	0.09
13.50	5.66	0.12	0.08
14.00	5.81	0.14	0.06
14.50	5.93	0.16	0.06
15.00	6.04	0.18	0.05
15.50	6.14	0.19	0.05
16.00	6.23	0.21	0.05
16.50	6.31	0.22	0.04
17.00	6.38	0.24	0.04
17.50	6.45	0.25	0.04
18.00	6.52	0.27	0.04
18.50	6.58	0.28	0.04
19.00	6.64	0.29	0.04
19.50	6.69	0.30	0.03
20.00	6.74	0.31	0.03
20.50	6.79	0.32	0.03
21.00	6.83	0.33	0.03
21.50	6.87	0.34	0.03
22.00	6.92	0.35	0.03
22.50	6.96	0.36	0.03
23.00	7.00	0.37	0.03
23.50	7.04	0.38	0.03
24.00	**7.08**	**0.39**	0.03
24.50	7.08	0.39	0.00
25.00	7.08	0.39	0.00
25.50	7.08	0.39	0.00
26.00	7.08	0.39	0.00
26.50	7.08	0.39	0.00
27.00	7.08	0.39	0.00
27.50	7.08	0.39	0.00
28.00	7.08	0.39	0.00
28.50	7.08	0.39	0.00
29.00	7.08	0.39	0.00
29.50	7.08	0.39	0.00
30.00	7.08	0.39	0.00
30.50	7.08	0.39	0.00
31.00	7.08	0.39	0.00
31.50	7.08	0.39	0.00
32.00	7.08	0.39	0.00
32.50	7.08	0.39	0.00
33.00	7.08	0.39	0.00
33.50	7.08	0.39	0.00
34.00	7.08	0.39	0.00
34.50	7.08	0.39	0.00
35.00	7.08	0.39	0.00
35.50	7.08	0.39	0.00
36.00	7.08	0.39	0.00
36.50	7.08	0.39	0.00
37.00	7.08	0.39	0.00
37.50	7.08	0.39	0.00
38.00	7.08	0.39	0.00
38.50	7.08	0.39	0.00
39.00	7.08	0.39	0.00
39.50	7.08	0.39	0.00
40.00	7.08	0.39	0.00
40.50	7.08	0.39	0.00
41.00	7.08	0.39	0.00
41.50	7.08	0.39	0.00
42.00	7.08	0.39	0.00
42.50	7.08	0.39	0.00
43.00	7.08	0.39	0.00
43.50	7.08	0.39	0.00
44.00	7.08	0.39	0.00
44.50	7.08	0.39	0.00
45.00	7.08	0.39	0.00
45.50	7.08	0.39	0.00
46.00	7.08	0.39	0.00
46.50	7.08	0.39	0.00
47.00	7.08	0.39	0.00
47.50	7.08	0.39	0.00
48.00	7.08	0.39	0.00

Summary for Subcatchment 6S: DA-2

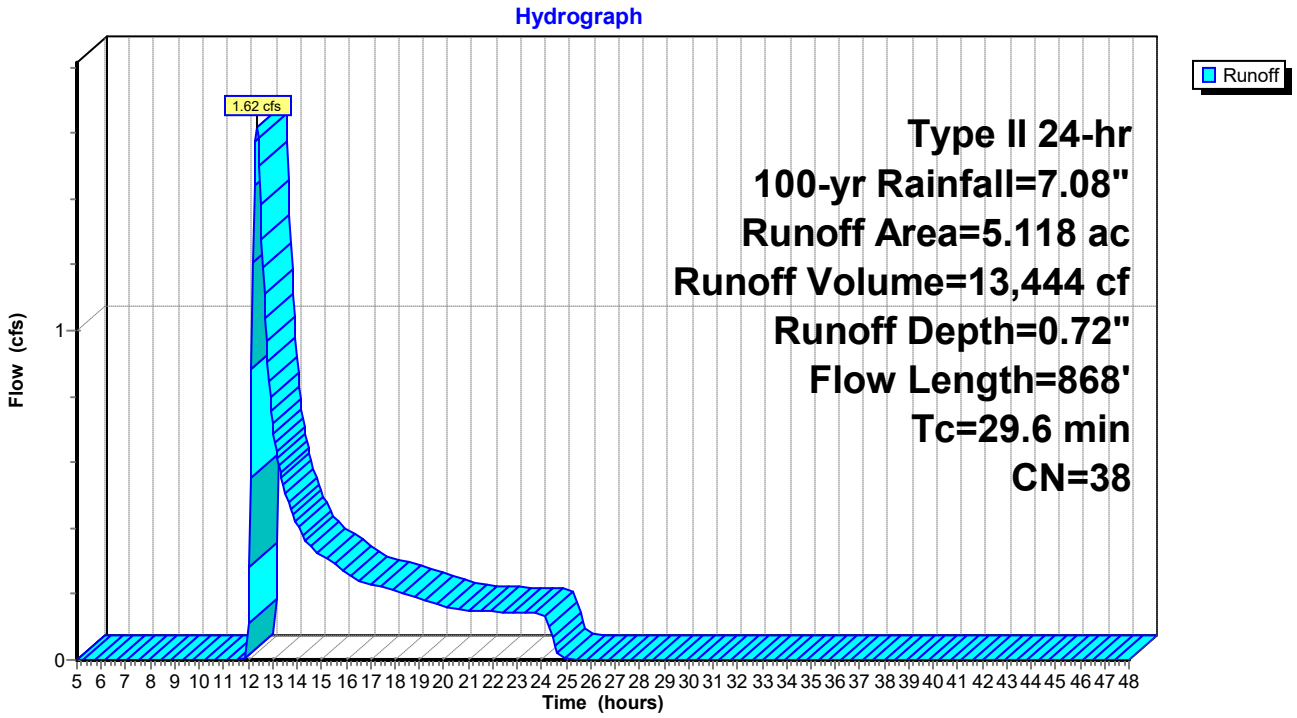
Runoff = 1.62 cfs @ 12.35 hrs, Volume= 13,444 cf, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.08"

	Area (ac)	CN	Description
	3.101	36	Woods, Fair, HSG A
	1.615	30	Meadow, non-grazed, HSG A
*	0.402	89	Gravel area
	5.118	38	Weighted Average
	5.118		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3	80	0.0500	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
3.5	262	0.0610	1.23		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	122	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	56	0.1070	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	232	0.0520	3.81	6.86	**Channel Flow, Diversion Channel** Area= 1.8 sf Perim= 5.0' r= 0.36' n= 0.045
2.1	116	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.6	868	Total			

Subcatchment 6S: DA-2



Hydrograph for Subcatchment 6S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.45	0.00	0.00
5.50	0.50	0.00	0.00
6.00	0.57	0.00	0.00
6.50	0.63	0.00	0.00
7.00	0.70	0.00	0.00
7.50	0.77	0.00	0.00
8.00	0.85	0.00	0.00
8.50	0.94	0.00	0.00
9.00	1.04	0.00	0.00
9.50	1.15	0.00	0.00
10.00	1.28	0.00	0.00
10.50	1.44	0.00	0.00
11.00	1.66	0.00	0.00
11.50	2.00	0.00	0.00
12.00	4.69	0.12	**0.11**
12.50	5.20	0.21	**1.38**
13.00	5.47	0.26	0.72
13.50	5.66	0.31	0.51
14.00	5.81	0.34	0.41
14.50	5.93	0.37	0.35
15.00	6.04	0.40	0.32
15.50	6.14	0.43	0.29
16.00	6.23	0.46	0.27
16.50	6.31	0.48	0.24
17.00	6.38	0.50	0.23
17.50	6.45	0.52	0.22
18.00	6.52	0.54	0.21
18.50	6.58	0.56	0.20
19.00	6.64	0.58	0.19
19.50	6.69	0.60	0.18
20.00	6.74	0.61	0.16
20.50	6.79	0.63	0.15
21.00	6.83	0.64	0.15
21.50	6.87	0.65	0.15
22.00	6.92	0.67	0.15
22.50	6.96	0.68	0.15
23.00	7.00	0.70	0.14
23.50	7.04	0.71	0.14
24.00	**7.08**	**0.72**	0.14
24.50	7.08	0.72	0.05
25.00	7.08	0.72	0.00
25.50	7.08	0.72	0.00
26.00	7.08	0.72	0.00
26.50	7.08	0.72	0.00
27.00	7.08	0.72	0.00
27.50	7.08	0.72	0.00
28.00	7.08	0.72	0.00
28.50	7.08	0.72	0.00
29.00	7.08	0.72	0.00
29.50	7.08	0.72	0.00
30.00	7.08	0.72	0.00
30.50	7.08	0.72	0.00
31.00	7.08	0.72	0.00
31.50	7.08	0.72	0.00
32.00	7.08	0.72	0.00
32.50	7.08	0.72	0.00
33.00	7.08	0.72	0.00
33.50	7.08	0.72	0.00
34.00	7.08	0.72	0.00
34.50	7.08	0.72	0.00
35.00	7.08	0.72	0.00
35.50	7.08	0.72	0.00
36.00	7.08	0.72	0.00
36.50	7.08	0.72	0.00
37.00	7.08	0.72	0.00
37.50	7.08	0.72	0.00
38.00	7.08	0.72	0.00
38.50	7.08	0.72	0.00
39.00	7.08	0.72	0.00
39.50	7.08	0.72	0.00
40.00	7.08	0.72	0.00
40.50	7.08	0.72	0.00
41.00	7.08	0.72	0.00
41.50	7.08	0.72	0.00
42.00	7.08	0.72	0.00
42.50	7.08	0.72	0.00
43.00	7.08	0.72	0.00
43.50	7.08	0.72	0.00
44.00	7.08	0.72	0.00
44.50	7.08	0.72	0.00
45.00	7.08	0.72	0.00
45.50	7.08	0.72	0.00
46.00	7.08	0.72	0.00
46.50	7.08	0.72	0.00
47.00	7.08	0.72	0.00
47.50	7.08	0.72	0.00
48.00	7.08	0.72	0.00

Summary for Subcatchment 7S: DA-3

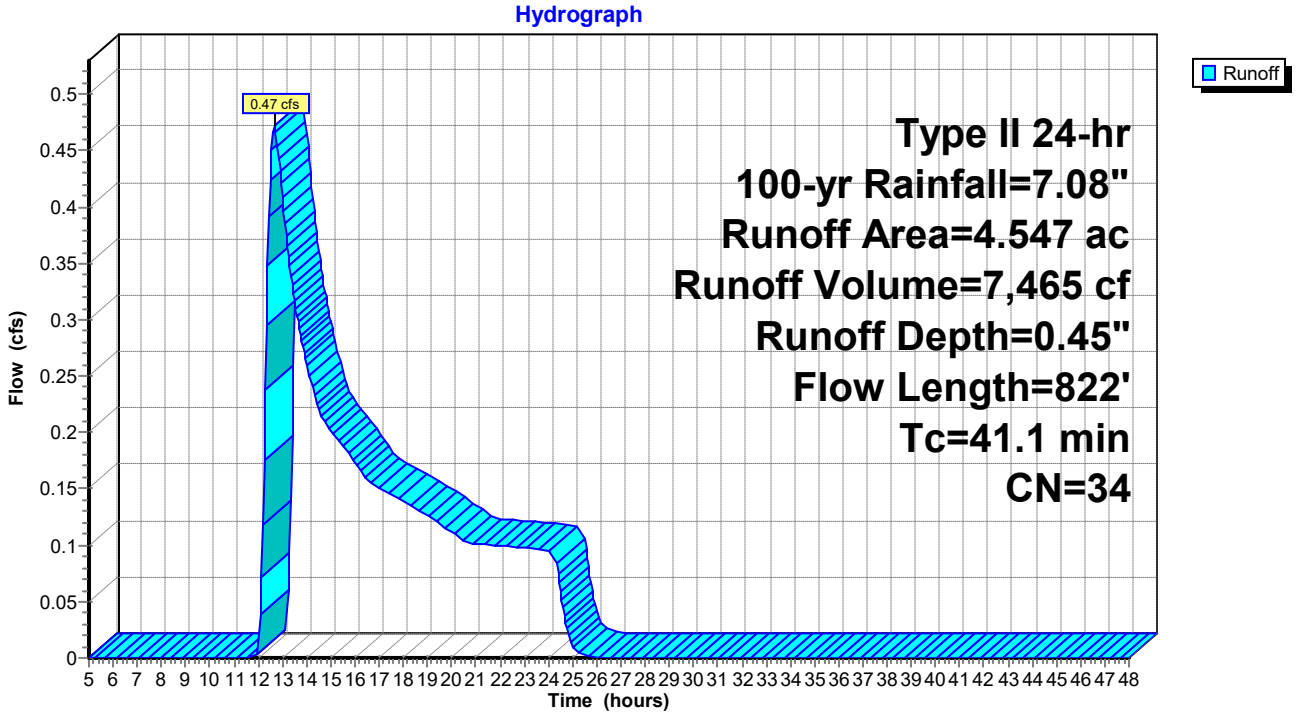
Runoff = 0.47 cfs @ 12.66 hrs, Volume= 7,465 cf, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.08"

Area (ac)	CN	Description
3.255	36	Woods, Fair, HSG A
1.292	30	Meadow, non-grazed, HSG A
4.547	34	Weighted Average
4.547		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.6	98	0.0250	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
5.8	592	0.1140	1.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	132	0.1780	2.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
41.1	822	Total			

Subcatchment 7S: DA-3



Hydrograph for Subcatchment 7S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.45	0.00	0.00
5.50	0.50	0.00	0.00
6.00	0.57	0.00	0.00
6.50	0.63	0.00	0.00
7.00	0.70	0.00	0.00
7.50	0.77	0.00	0.00
8.00	0.85	0.00	0.00
8.50	0.94	0.00	0.00
9.00	1.04	0.00	0.00
9.50	1.15	0.00	0.00
10.00	1.28	0.00	0.00
10.50	1.44	0.00	0.00
11.00	1.66	0.00	0.00
11.50	2.00	0.00	0.00
12.00	4.69	0.03	0.00
12.50	5.20	0.08	**0.42**
13.00	5.47	0.12	**0.41**
13.50	5.66	0.15	0.32
14.00	5.81	0.17	0.26
14.50	5.93	0.20	0.22
15.00	6.04	0.22	0.20
15.50	6.14	0.24	0.19
16.00	6.23	0.25	0.17
16.50	6.31	0.27	0.16
17.00	6.38	0.29	0.15
17.50	6.45	0.30	0.14
18.00	6.52	0.32	0.14
18.50	6.58	0.33	0.13
19.00	6.64	0.34	0.13
19.50	6.69	0.36	0.12
20.00	6.74	0.37	0.11
20.50	6.79	0.38	0.10
21.00	6.83	0.39	0.10
21.50	6.87	0.40	0.10
22.00	6.92	0.41	0.10
22.50	6.96	0.42	0.10
23.00	7.00	0.43	0.10
23.50	7.04	0.44	0.10
24.00	**7.08**	**0.45**	0.10
24.50	7.08	0.45	0.06
25.00	7.08	0.45	0.01
25.50	7.08	0.45	0.00
26.00	7.08	0.45	0.00
26.50	7.08	0.45	0.00
27.00	7.08	0.45	0.00
27.50	7.08	0.45	0.00
28.00	7.08	0.45	0.00
28.50	7.08	0.45	0.00
29.00	7.08	0.45	0.00
29.50	7.08	0.45	0.00
30.00	7.08	0.45	0.00
30.50	7.08	0.45	0.00
31.00	7.08	0.45	0.00
31.50	7.08	0.45	0.00
32.00	7.08	0.45	0.00
32.50	7.08	0.45	0.00
33.00	7.08	0.45	0.00
33.50	7.08	0.45	0.00
34.00	7.08	0.45	0.00
34.50	7.08	0.45	0.00
35.00	7.08	0.45	0.00
35.50	7.08	0.45	0.00
36.00	7.08	0.45	0.00
36.50	7.08	0.45	0.00
37.00	7.08	0.45	0.00
37.50	7.08	0.45	0.00
38.00	7.08	0.45	0.00
38.50	7.08	0.45	0.00
39.00	7.08	0.45	0.00
39.50	7.08	0.45	0.00
40.00	7.08	0.45	0.00
40.50	7.08	0.45	0.00
41.00	7.08	0.45	0.00
41.50	7.08	0.45	0.00
42.00	7.08	0.45	0.00
42.50	7.08	0.45	0.00
43.00	7.08	0.45	0.00
43.50	7.08	0.45	0.00
44.00	7.08	0.45	0.00
44.50	7.08	0.45	0.00
45.00	7.08	0.45	0.00
45.50	7.08	0.45	0.00
46.00	7.08	0.45	0.00
46.50	7.08	0.45	0.00
47.00	7.08	0.45	0.00
47.50	7.08	0.45	0.00
48.00	7.08	0.45	0.00

Summary for Subcatchment 8S: DA-4

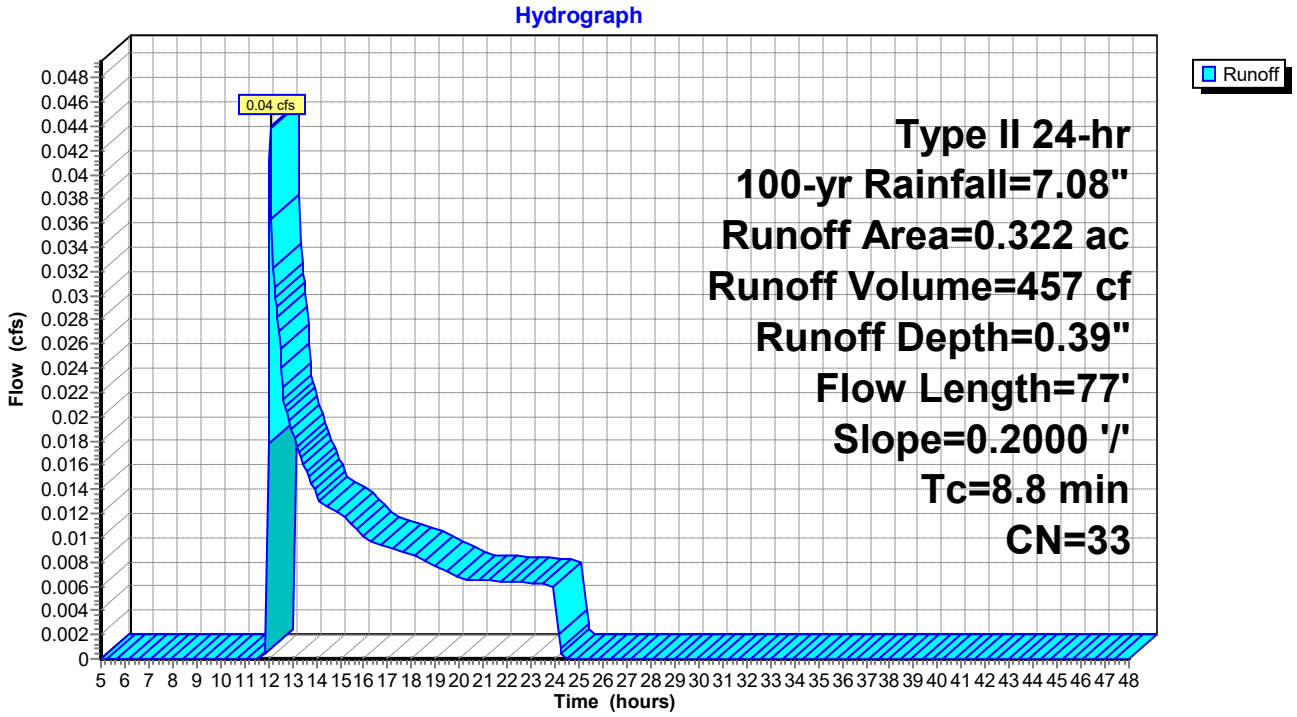
Runoff = 0.04 cfs @ 12.09 hrs, Volume= 457 cf, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.08"

Area (ac)	CN	Description
0.143	36	Woods, Fair, HSG A
0.179	30	Meadow, non-grazed, HSG A
0.322	33	Weighted Average
0.322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	40	0.2000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.03"
6.9	37	0.2000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.03"
8.8	77	Total			

Subcatchment 8S: DA-4



Hydrograph for Subcatchment 8S: DA-4

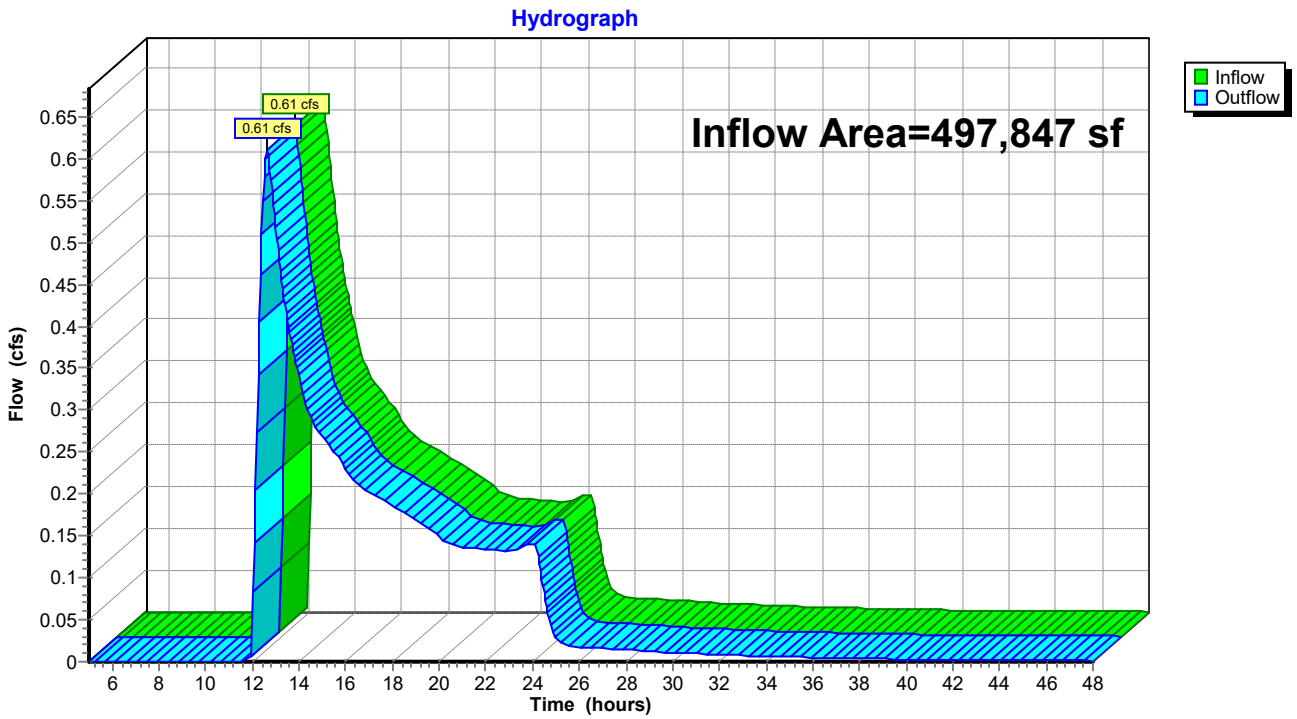
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.45	0.00	0.00
5.50	0.50	0.00	0.00
6.00	0.57	0.00	0.00
6.50	0.63	0.00	0.00
7.00	0.70	0.00	0.00
7.50	0.77	0.00	0.00
8.00	0.85	0.00	0.00
8.50	0.94	0.00	0.00
9.00	1.04	0.00	0.00
9.50	1.15	0.00	0.00
10.00	1.28	0.00	0.00
10.50	1.44	0.00	0.00
11.00	1.66	0.00	0.00
11.50	2.00	0.00	0.00
12.00	4.69	0.02	**0.02**
12.50	5.20	0.06	**0.03**
13.00	5.47	0.09	0.02
13.50	5.66	0.12	0.02
14.00	5.81	0.14	0.01
14.50	5.93	0.16	0.01
15.00	6.04	0.18	0.01
15.50	6.14	0.19	0.01
16.00	6.23	0.21	0.01
16.50	6.31	0.22	0.01
17.00	6.38	0.24	0.01
17.50	6.45	0.25	0.01
18.00	6.52	0.27	0.01
18.50	6.58	0.28	0.01
19.00	6.64	0.29	0.01
19.50	6.69	0.30	0.01
20.00	6.74	0.31	0.01
20.50	6.79	0.32	0.01
21.00	6.83	0.33	0.01
21.50	6.87	0.34	0.01
22.00	6.92	0.35	0.01
22.50	6.96	0.36	0.01
23.00	7.00	0.37	0.01
23.50	7.04	0.38	0.01
24.00	**7.08**	**0.39**	0.01
24.50	7.08	0.39	0.00
25.00	7.08	0.39	0.00
25.50	7.08	0.39	0.00
26.00	7.08	0.39	0.00
26.50	7.08	0.39	0.00
27.00	7.08	0.39	0.00
27.50	7.08	0.39	0.00
28.00	7.08	0.39	0.00
28.50	7.08	0.39	0.00
29.00	7.08	0.39	0.00
29.50	7.08	0.39	0.00
30.00	7.08	0.39	0.00
30.50	7.08	0.39	0.00
31.00	7.08	0.39	0.00
31.50	7.08	0.39	0.00
32.00	7.08	0.39	0.00
32.50	7.08	0.39	0.00
33.00	7.08	0.39	0.00
33.50	7.08	0.39	0.00
34.00	7.08	0.39	0.00
34.50	7.08	0.39	0.00
35.00	7.08	0.39	0.00
35.50	7.08	0.39	0.00
36.00	7.08	0.39	0.00
36.50	7.08	0.39	0.00
37.00	7.08	0.39	0.00
37.50	7.08	0.39	0.00
38.00	7.08	0.39	0.00
38.50	7.08	0.39	0.00
39.00	7.08	0.39	0.00
39.50	7.08	0.39	0.00
40.00	7.08	0.39	0.00
40.50	7.08	0.39	0.00
41.00	7.08	0.39	0.00
41.50	7.08	0.39	0.00
42.00	7.08	0.39	0.00
42.50	7.08	0.39	0.00
43.00	7.08	0.39	0.00
43.50	7.08	0.39	0.00
44.00	7.08	0.39	0.00
44.50	7.08	0.39	0.00
45.00	7.08	0.39	0.00
45.50	7.08	0.39	0.00
46.00	7.08	0.39	0.00
46.50	7.08	0.39	0.00
47.00	7.08	0.39	0.00
47.50	7.08	0.39	0.00
48.00	7.08	0.39	0.00

Summary for Reach 10R: Post w/BMP

Inflow Area = 497,847 sf, 0.00% Impervious, Inflow Depth > 0.26" for 100-yr event
Inflow = 0.61 cfs @ 12.63 hrs, Volume= 10,596 cf
Outflow = 0.61 cfs @ 12.63 hrs, Volume= 10,596 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/BMP



Hydrograph for Reach 10R: Post w/BMP

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	30.50	0.01		0.01
5.50	0.00		0.00	31.00	0.01		0.01
6.00	0.00		0.00	31.50	0.01		0.01
6.50	0.00		0.00	32.00	0.01		0.01
7.00	0.00		0.00	32.50	0.01		0.01
7.50	0.00		0.00	33.00	0.01		0.01
8.00	0.00		0.00	33.50	0.01		0.01
8.50	0.00		0.00	34.00	0.01		0.01
9.00	0.00		0.00	34.50	0.01		0.01
9.50	0.00		0.00	35.00	0.01		0.01
10.00	0.00		0.00	35.50	0.01		0.01
10.50	0.00		0.00	36.00	0.00		0.00
11.00	0.00		0.00	36.50	0.00		0.00
11.50	0.00		0.00	37.00	0.00		0.00
12.00	0.03		0.03	37.50	0.00		0.00
12.50	**0.58**		**0.58**	38.00	0.00		0.00
13.00	**0.52**		**0.52**	38.50	0.00		0.00
13.50	0.41		0.41	39.00	0.00		0.00
14.00	0.34		0.34	39.50	0.00		0.00
14.50	0.29		0.29	40.00	0.00		0.00
15.00	0.27		0.27	40.50	0.00		0.00
15.50	0.25		0.25	41.00	0.00		0.00
16.00	0.23		0.23	41.50	0.00		0.00
16.50	0.21		0.21	42.00	0.00		0.00
17.00	0.20		0.20	42.50	0.00		0.00
17.50	0.19		0.19	43.00	0.00		0.00
18.00	0.19		0.19	43.50	0.00		0.00
18.50	0.18		0.18	44.00	0.00		0.00
19.00	0.17		0.17	44.50	0.00		0.00
19.50	0.16		0.16	45.00	0.00		0.00
20.00	0.15		0.15	45.50	0.00		0.00
20.50	0.14		0.14	46.00	0.00		0.00
21.00	0.14		0.14	46.50	0.00		0.00
21.50	0.14		0.14	47.00	0.00		0.00
22.00	0.13		0.13	47.50	0.00		0.00
22.50	0.13		0.13	48.00	0.00		0.00
23.00	0.13		0.13				
23.50	0.14		0.14				
24.00	0.14		0.14				
24.50	0.08		0.08				
25.00	0.03		0.03				
25.50	0.02		0.02				
26.00	0.02		0.02				
26.50	0.02		0.02				
27.00	0.02		0.02				
27.50	0.01		0.01				
28.00	0.01		0.01				
28.50	0.01		0.01				
29.00	0.01		0.01				
29.50	0.01		0.01				
30.00	0.01		0.01				

Summary for Pond 6P: Wet Pond

Inflow Area = 222,940 sf, 0.00% Impervious, Inflow Depth = 0.72" for 100-yr event
Inflow = 1.62 cfs @ 12.35 hrs, Volume= 13,444 cf
Outflow = 0.02 cfs @ 24.67 hrs, Volume= 628 cf, Atten= 99%, Lag= 739.2 min
Primary = 0.02 cfs @ 24.67 hrs, Volume= 628 cf

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,246.11' @ 24.67 hrs Surf.Area= 5,184 sf Storage= 13,362 cf

Plug-Flow detention time= 1,098.1 min calculated for 628 cf (5% of inflow)
Center-of-Mass det. time= 870.2 min (1,827.8 - 957.5)

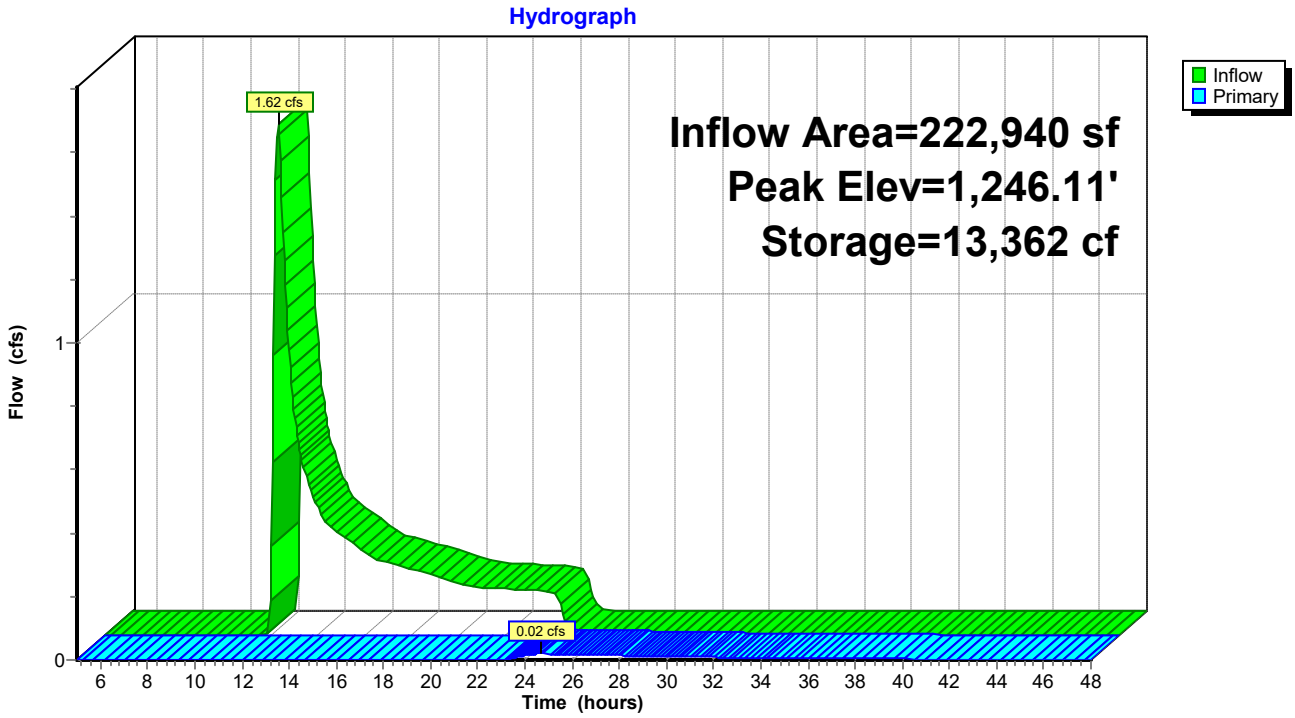
Volume	Invert	Avail.Storage	Storage Description
#1	1,242.50'	48,940 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,242.50	2,285	0	0
1,244.00	3,425	4,283	4,283
1,246.00	5,081	8,506	12,789
1,248.00	6,932	12,013	24,802
1,250.00	8,031	14,963	39,765
1,251.00	10,320	9,176	48,940

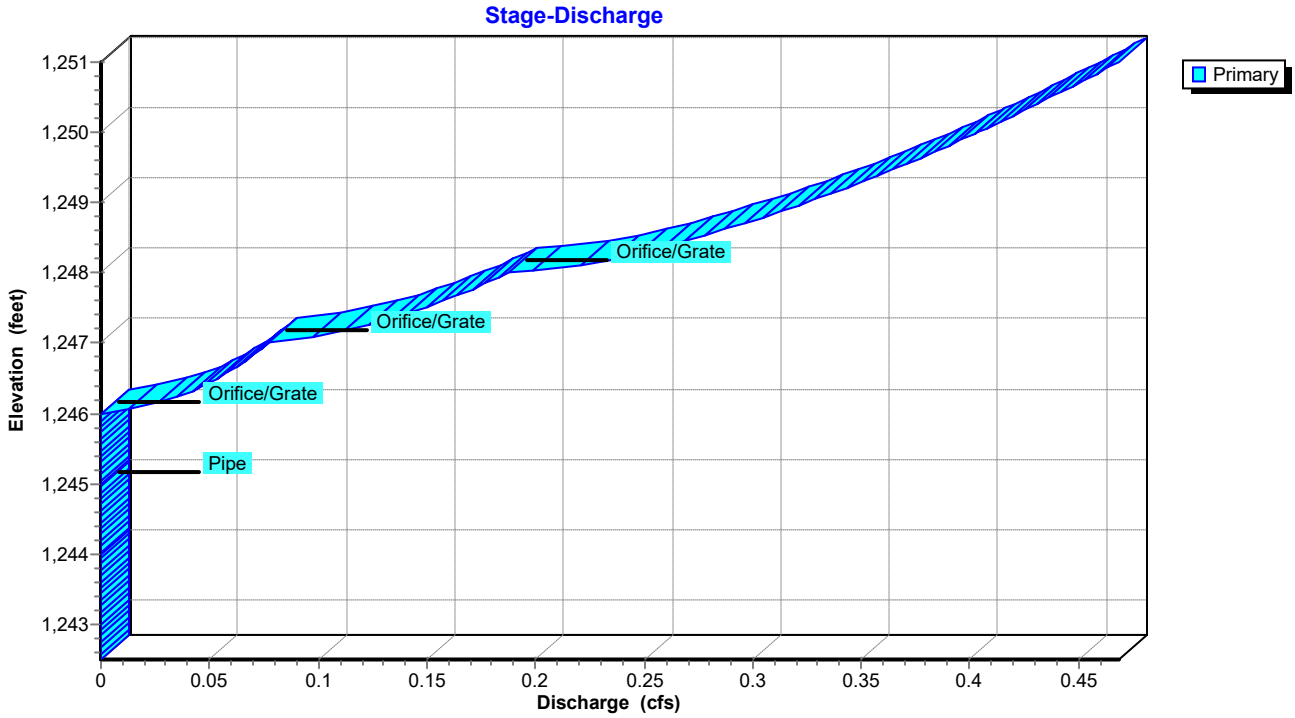
Device	Routing	Invert	Outlet Devices
#1	Primary	1,245.00'	**15.0" Round Pipe** L= 100.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,245.00' / 1,243.00' S= 0.0200 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	1,246.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	1,247.00'	**1.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,248.00'	**1.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.02 cfs @ 24.67 hrs HW=1,246.11' (Free Discharge)
└─**1=Pipe** (Passes 0.02 cfs of 4.14 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 1.27 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Wet Pond



Pond 6P: Wet Pond



Hydrograph for Pond 6P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	1,242.50	0.00
6.00	0.00	0	1,242.50	0.00
7.00	0.00	0	1,242.50	0.00
8.00	0.00	0	1,242.50	0.00
9.00	0.00	0	1,242.50	0.00
10.00	0.00	0	1,242.50	0.00
11.00	0.00	0	1,242.50	0.00
12.00	**0.11**	16	1,242.51	0.00
13.00	**0.72**	3,846	1,243.87	0.00
14.00	0.41	5,738	1,244.40	0.00
15.00	0.32	7,007	1,244.73	0.00
16.00	0.27	8,062	1,244.99	0.00
17.00	0.23	8,939	1,245.19	0.00
18.00	0.21	9,732	1,245.37	0.00
19.00	0.19	10,450	1,245.52	0.00
20.00	0.16	11,085	1,245.65	0.00
21.00	0.15	11,643	1,245.77	0.00
22.00	0.15	12,180	1,245.88	0.00
23.00	0.14	12,704	1,245.98	0.00
24.00	0.14	**13,192**	**1,246.08**	**0.01**
25.00	0.00	**13,351**	**1,246.11**	**0.02**
26.00	0.00	13,287	1,246.10	0.02
27.00	0.00	13,228	1,246.09	0.02
28.00	0.00	13,174	1,246.08	0.01
29.00	0.00	13,126	1,246.07	0.01
30.00	0.00	13,084	1,246.06	0.01
31.00	0.00	13,048	1,246.05	0.01
32.00	0.00	13,015	1,246.04	0.01
33.00	0.00	12,987	1,246.04	0.01
34.00	0.00	12,962	1,246.03	0.01
35.00	0.00	12,941	1,246.03	0.01
36.00	0.00	12,922	1,246.03	0.00
37.00	0.00	12,905	1,246.02	0.00
38.00	0.00	12,891	1,246.02	0.00
39.00	0.00	12,878	1,246.02	0.00
40.00	0.00	12,867	1,246.02	0.00
41.00	0.00	12,857	1,246.01	0.00
42.00	0.00	12,849	1,246.01	0.00
43.00	0.00	12,841	1,246.01	0.00
44.00	0.00	12,835	1,246.01	0.00
45.00	0.00	12,829	1,246.01	0.00
46.00	0.00	12,824	1,246.01	0.00
47.00	0.00	12,819	1,246.01	0.00
48.00	0.00	12,816	1,246.01	0.00

Stage-Discharge for Pond 6P: Wet Pond

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
1,242.50	0.00	1,247.60	0.16
1,242.60	0.00	1,247.70	0.17
1,242.70	0.00	1,247.80	0.17
1,242.80	0.00	1,247.90	0.18
1,242.90	0.00	1,248.00	0.19
1,243.00	0.00	1,248.10	0.22
1,243.10	0.00	1,248.20	0.24
1,243.20	0.00	1,248.30	0.25
1,243.30	0.00	1,248.40	0.26
1,243.40	0.00	1,248.50	0.27
1,243.50	0.00	1,248.60	0.29
1,243.60	0.00	1,248.70	0.30
1,243.70	0.00	1,248.80	0.31
1,243.80	0.00	1,248.90	0.32
1,243.90	0.00	1,249.00	0.32
1,244.00	0.00	1,249.10	0.33
1,244.10	0.00	1,249.20	0.34
1,244.20	0.00	1,249.30	0.35
1,244.30	0.00	1,249.40	0.36
1,244.40	0.00	1,249.50	0.37
1,244.50	0.00	1,249.60	0.37
1,244.60	0.00	1,249.70	0.38
1,244.70	0.00	1,249.80	0.39
1,244.80	0.00	1,249.90	0.40
1,244.90	0.00	1,250.00	0.40
1,245.00	0.00	1,250.10	0.41
1,245.10	0.00	1,250.20	0.42
1,245.20	0.00	1,250.30	0.42
1,245.30	0.00	1,250.40	0.43
1,245.40	0.00	1,250.50	0.44
1,245.50	0.00	1,250.60	0.44
1,245.60	0.00	1,250.70	0.45
1,245.70	0.00	1,250.80	0.46
1,245.80	0.00	1,250.90	0.46
1,245.90	0.00	1,251.00	**0.47**
1,246.00	0.00		
1,246.10	0.02		
1,246.20	0.03		
1,246.30	0.04		
1,246.40	0.05		
1,246.50	0.05		
1,246.60	0.06		
1,246.70	0.06		
1,246.80	0.07		
1,246.90	0.07		
1,247.00	0.08		
1,247.10	0.10		
1,247.20	0.12		
1,247.30	0.13		
1,247.40	0.14		
1,247.50	0.15		

Stage-Area-Storage for Pond 6P: Wet Pond

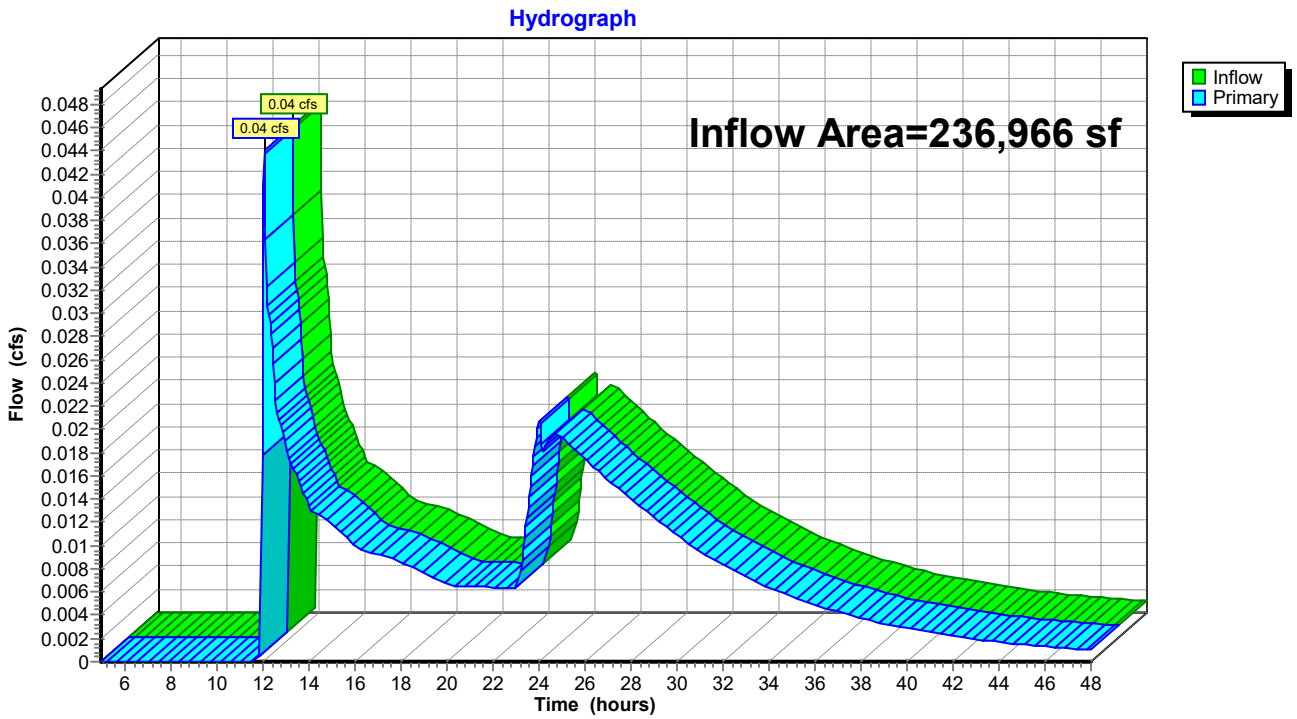
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,242.50	2,285	0
1,242.60	2,361	232
1,242.70	2,437	472
1,242.80	2,513	720
1,242.90	2,589	975
1,243.00	2,665	1,238
1,243.10	2,741	1,508
1,243.20	2,817	1,786
1,243.30	2,893	2,071
1,243.40	2,969	2,364
1,243.50	3,045	2,665
1,243.60	3,121	2,973
1,243.70	3,197	3,289
1,243.80	3,273	3,613
1,243.90	3,349	3,944
1,244.00	3,425	4,283
1,244.10	3,508	4,629
1,244.20	3,591	4,984
1,244.30	3,673	5,347
1,244.40	3,756	5,719
1,244.50	3,839	6,099
1,244.60	3,922	6,487
1,244.70	4,005	6,883
1,244.80	4,087	7,287
1,244.90	4,170	7,700
1,245.00	4,253	8,122
1,245.10	4,336	8,551
1,245.20	4,419	8,989
1,245.30	4,501	9,435
1,245.40	4,584	9,889
1,245.50	4,667	10,352
1,245.60	4,750	10,822
1,245.70	4,833	11,301
1,245.80	4,915	11,789
1,245.90	4,998	12,285
1,246.00	5,081	12,789
1,246.10	5,174	13,301
1,246.20	5,266	13,823
1,246.30	5,359	14,354
1,246.40	5,451	14,895
1,246.50	5,544	15,445
1,246.60	5,636	16,004
1,246.70	5,729	16,572
1,246.80	5,821	17,149
1,246.90	5,914	17,736
1,247.00	6,007	18,332
1,247.10	6,099	18,938
1,247.20	6,192	19,552
1,247.30	6,284	20,176
1,247.40	6,377	20,809
1,247.50	6,469	21,451
1,247.60	6,562	22,103
1,247.70	6,654	22,764
1,247.80	6,747	23,434
1,247.90	6,839	24,113
1,248.00	6,932	24,802
1,248.10	6,987	25,497
1,248.20	7,042	26,199
1,248.30	7,097	26,906
1,248.40	7,152	27,618
1,248.50	7,207	28,336
1,248.60	7,262	29,060
1,248.70	7,317	29,789
1,248.80	7,372	30,523
1,248.90	7,427	31,263
1,249.00	7,482	32,008
1,249.10	7,536	32,759
1,249.20	7,591	33,516
1,249.30	7,646	34,277
1,249.40	7,701	35,045
1,249.50	7,756	35,818
1,249.60	7,811	36,596
1,249.70	7,866	37,380
1,249.80	7,921	38,169
1,249.90	7,976	38,964
1,250.00	8,031	39,765
1,250.10	8,260	40,579
1,250.20	8,489	41,416
1,250.30	8,718	42,277
1,250.40	8,947	43,160
1,250.50	9,176	44,066
1,250.60	9,404	44,995
1,250.70	9,633	45,947
1,250.80	9,862	46,922
1,250.90	10,091	47,919
1,251.00	**10,320**	**48,940**

Summary for Link 5L:

Inflow Area = 236,966 sf, 0.00% Impervious, Inflow Depth > 0.05" for 100-yr event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 1,085 cf
Primary = 0.04 cfs @ 12.09 hrs, Volume= 1,085 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Link 5L:

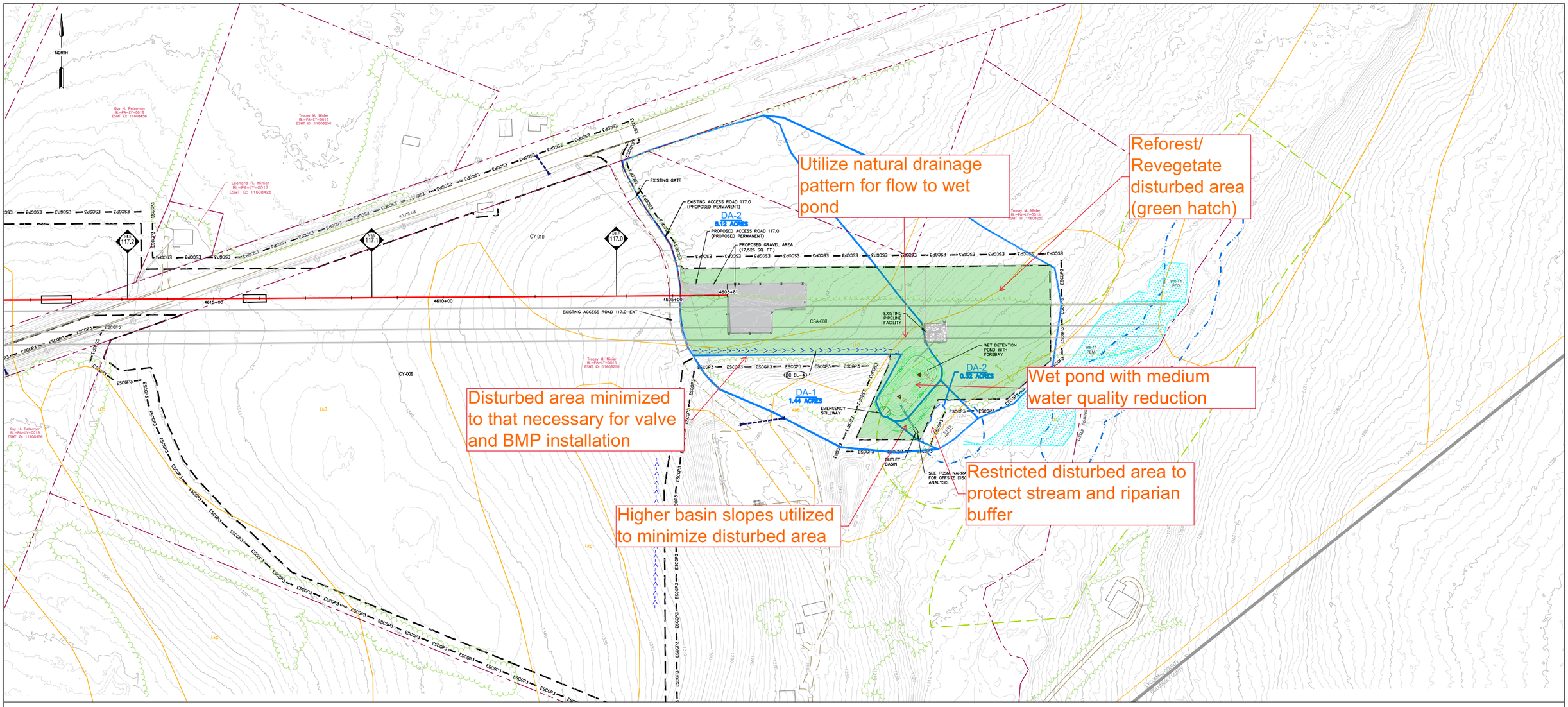


Hydrograph for Link 5L:

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00	30.50	0.01	0.00	0.01
5.50	0.00	0.00	0.00	31.00	0.01	0.00	0.01
6.00	0.00	0.00	0.00	31.50	0.01	0.00	0.01
6.50	0.00	0.00	0.00	32.00	0.01	0.00	0.01
7.00	0.00	0.00	0.00	32.50	0.01	0.00	0.01
7.50	0.00	0.00	0.00	33.00	0.01	0.00	0.01
8.00	0.00	0.00	0.00	33.50	0.01	0.00	0.01
8.50	0.00	0.00	0.00	34.00	0.01	0.00	0.01
9.00	0.00	0.00	0.00	34.50	0.01	0.00	0.01
9.50	0.00	0.00	0.00	35.00	0.01	0.00	0.01
10.00	0.00	0.00	0.00	35.50	0.01	0.00	0.01
10.50	0.00	0.00	0.00	36.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	36.50	0.00	0.00	0.00
11.50	0.00	0.00	0.00	37.00	0.00	0.00	0.00
12.00	**0.02**	0.00	**0.02**	37.50	0.00	0.00	0.00
12.50	**0.03**	0.00	**0.03**	38.00	0.00	0.00	0.00
13.00	0.02	0.00	0.02	38.50	0.00	0.00	0.00
13.50	0.02	0.00	0.02	39.00	0.00	0.00	0.00
14.00	0.01	0.00	0.01	39.50	0.00	0.00	0.00
14.50	0.01	0.00	0.01	40.00	0.00	0.00	0.00
15.00	0.01	0.00	0.01	40.50	0.00	0.00	0.00
15.50	0.01	0.00	0.01	41.00	0.00	0.00	0.00
16.00	0.01	0.00	0.01	41.50	0.00	0.00	0.00
16.50	0.01	0.00	0.01	42.00	0.00	0.00	0.00
17.00	0.01	0.00	0.01	42.50	0.00	0.00	0.00
17.50	0.01	0.00	0.01	43.00	0.00	0.00	0.00
18.00	0.01	0.00	0.01	43.50	0.00	0.00	0.00
18.50	0.01	0.00	0.01	44.00	0.00	0.00	0.00
19.00	0.01	0.00	0.01	44.50	0.00	0.00	0.00
19.50	0.01	0.00	0.01	45.00	0.00	0.00	0.00
20.00	0.01	0.00	0.01	45.50	0.00	0.00	0.00
20.50	0.01	0.00	0.01	46.00	0.00	0.00	0.00
21.00	0.01	0.00	0.01	46.50	0.00	0.00	0.00
21.50	0.01	0.00	0.01	47.00	0.00	0.00	0.00
22.00	0.01	0.00	0.01	47.50	0.00	0.00	0.00
22.50	0.01	0.00	0.01	48.00	0.00	0.00	0.00
23.00	0.01	0.00	0.01				
23.50	0.01	0.00	0.01				
24.00	0.02	0.00	0.02				
24.50	0.02	0.00	0.02				
25.00	0.02	0.00	0.02				
25.50	0.02	0.00	0.02				
26.00	0.02	0.00	0.02				
26.50	0.02	0.00	0.02				
27.00	0.02	0.00	0.02				
27.50	0.01	0.00	0.01				
28.00	0.01	0.00	0.01				
28.50	0.01	0.00	0.01				
29.00	0.01	0.00	0.01				
29.50	0.01	0.00	0.01				
30.00	0.01	0.00	0.01				

ATTACHMENT 5

NON-STRUCTURAL AND STRUCTURAL WATER QUALITY BMPS MAP



EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.

SOIL LEGEND

LkC	LECK KILL CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES
LkB	LECK KILL CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES

LEGEND

	DIVERSION CHANNEL		EXISTING UTILITY LINE
	PROPOSED PIPELINE		EXISTING VALVE
ESCGP-3	ESCGP-3 PERMIT BOUNDARY		EXISTING CULVERT
	LIMITS OF DISTURBANCE		EXISTING FENCE
	APPROX. ENVIRONMENTAL STUDY LIMITS		PROPOSED FENCE
	DELINEATED WETLAND		EXISTING STRUCTURE
	DELINEATED WATERWAY / STREAM (TOP OF BANK)		EXISTING ROAD (GRAVEL)
	STREAM FLOW DIRECTION		EXISTING ROAD (PAVED)
	RIPARIAN BUFFER		EXISTING GRAVEL AREAS
	50'/FEMA FLOODWAY		PROPOSED GRAVEL
FEMA	FEMA 100-YEAR FLOODPLAIN	1250	EXISTING GRADE MAJOR CONTOURS (2' C.I.)
LkC	SOIL BOUNDARY / TYPE	1244	EXISTING GRADE MINOR CONTOURS (10' C.I.)
	EXISTING TREELINE / TREE/SHRUB	1250	PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
	PROPERTY LINE	1244	PROPOSED GRADE MINOR CONTOURS (10' C.I.)
	EXISTING LEIDY / TGPL PIPELINES		PROPOSED CULVERT
	EXISTING FOREIGN PIPELINES		POST DEVELOPMENT DRAINAGE AREA
	EXISTING UTILITY POLE / TOWER		

NOT TO SCALE

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
041211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05-04-20	RHM	UPDATED PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - BENTON LOOP
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
EASTERN TERMINUS MAIN LINE VALVE
PROPOSED CONDITIONS PLAN
JORDAN TOWNSHIP, LYCOMING COUNTY, PENNSYLVANIA

DRAWN BY: SWH	DATE: 3/22/19	ISSUED FOR BID:	SCALE: 1" = 1000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 3
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 6

ATTACHMENT 6
OFFSITE DISCHARGE REPORT

Transcontinental Gas Pipe Line Company, LLC

Offsite Discharge Report

Leidy South Project – Benton Loop – Access Road and Valve Yard

Wet Pond Outlet Structure

May 2020

1.0 Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc., is proposing the Leidy South Project (Project). The Benton Loop is proposed as part of the overall Project. The Benton Loop will consist of approximately 3.5 miles of 42-inch pipeline co-located with the existing Transco Leidy Lines between approximate MPs 116.95 and 120.44 in Jordan Township, Lycoming County, Pennsylvania. Transco will be installing a Mainline Valve (MLV) near the eastern terminus of the Benton Loop as a means to isolate gas flows along sections of a pipeline. The new MLV facilities will require Erosion and Sediment (E&S) Control and Post Construction Stormwater Management (PCSM) Best Management Practices (BMP's) to manage stormwater runoff during and after construction.

Transco has developed an Offsite Discharge Report for the discharges associated with the proposed BMP's in response to technical deficiency comments issued by Pennsylvania Department of Environmental Protection (PaDEP) on April 3, 2020. An Offsite Discharge Report is performed to ensure that no offsite erosion will occur downstream of the proposed activities. The analysis conducted for this project followed the sequence outlined in PaDEP's factsheet for offsite discharges (Document #3930-FS-DEP4124).

2.0 Conveyance Best Management Practices

Erosion and Sediment Control and Post Construction Stormwater Management BMP's are proposed to manage stormwater runoff during and after construction. A sediment basin and wet pond will be installed to convey the net increase in volume between the pre and post development 2-year storm events and mitigate the increase (pre-post development) in peak runoff for the 2-, 10-, 50-, and 100-year storm events. An outlet basin, which flows to an offsite area, is proposed as the discharge structure at this location.

2.1 Sediment Basin / Wet Pond

The sediment basin/wet pond discharges and flows into the adjacent forested area located southeast of the Limits of Disturbance. The stormwater is being discharged as sheet flow and travels along a vegetative flow path until it reaches Little Fishing Creek. The flow path is depicted on Attachment A. Soil types and the erodibility factors within the flow path are shown on Table 1.

Table 1 – Soils Mapped within Flow Path	
Soil Mapping Unit	**Soil Erodibility Factor, K_f**
AbB	**K_f = 0.37**
LkD	**K_f = 0.37**

The soil erodibility factors are shown in Table 1. A low K value indicates the soil will not easily erode whereas a high K value means the soil will easily erode. All of the soils in the flow path are considered moderately erodible (0.37). Photos were taken along the flow path of the downstream area to show the vegetative cover.

Photo 1 : Existing Area at Proposed Outlet Basin

Photo 2 : Area Downgradient of the Proposed Outlet Basin

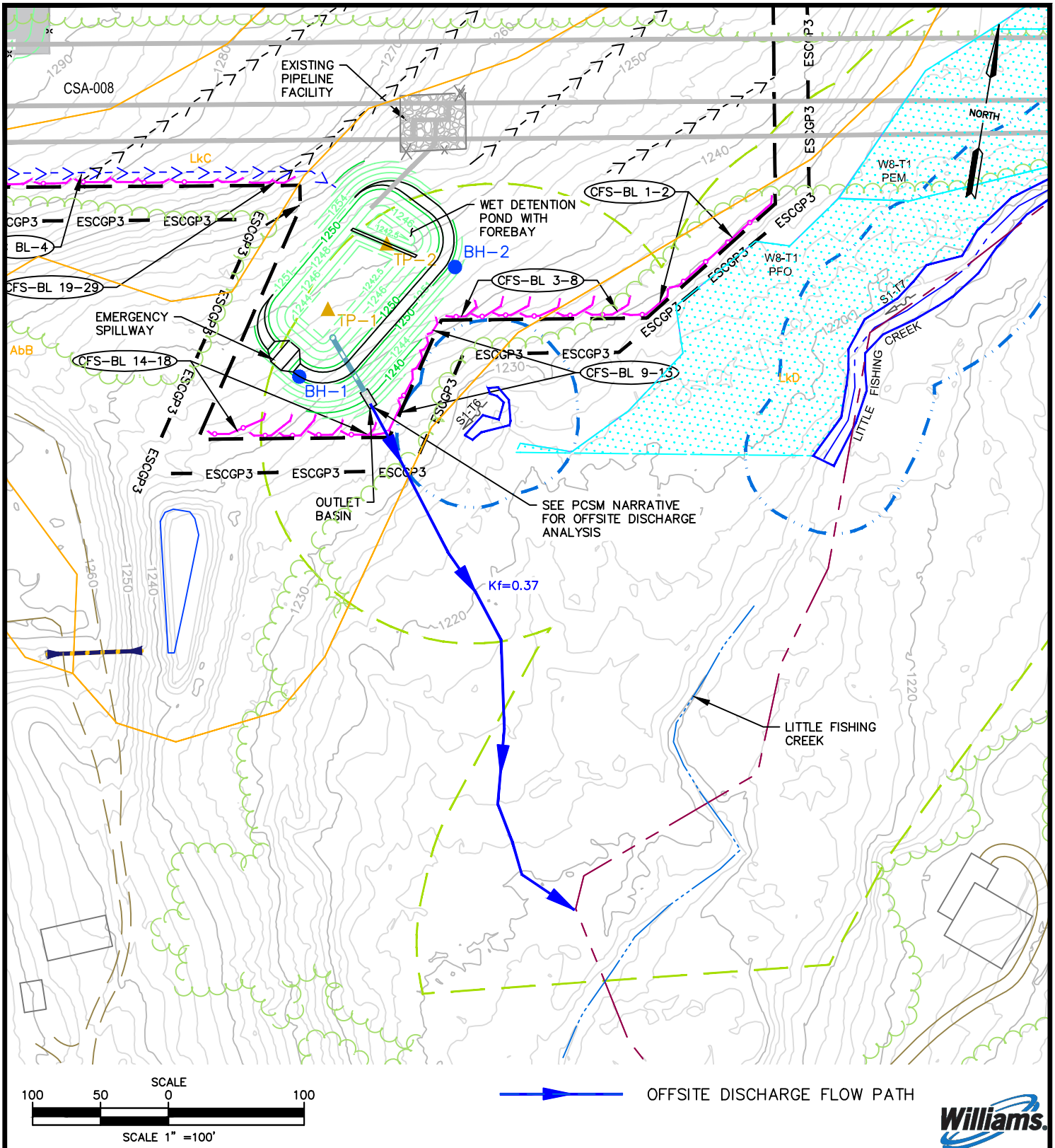
Photo 1 shows the existing condition where the outlet basin is proposed. The area will be graded to facilitate the installation of the sediment basin/wet pond and revegetated. Photo 2 shows the areas downgradient of the proposed outlet basin, which is over 90% vegetated. In the E&S and PCSM Narrative, site calculations are provided that show the Pre- and Post-Construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed outlet basin are 0.88 feet per second for the for the 25 year, 24-hour storm event.

3.0 Conclusion

The Offsite Discharge Report completed for the proposed sediment basin/wet pond indicated that the flow path downgradient of the outlet basin is not anticipated to erode during

storm events due to the existing vegetative conditions, low discharge velocities, and soil erodibility values.

ATTACHMENT A
OUTLET FLOW PATH MAPS



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2525 GREEN TECH DRIVE, SUITE B
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TELEPHONE: (814)-689-1650 FAX: (814)-689-1557

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - BENTON LOOP

EROSION AND SEDIMENTATION CONTROL PLAN

FLOW PATH

JORDAN TOWNSHIP LYCOMING COUNTY PENNSYLVANIA

DATE:	05/11/20
DRAWN BY:	RHM
CHECKED:	KCC
WHM DRAWING NO:	WET POND (FLOW PATH)

EXHIBIT 1.0

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

LEIDY SOUTH PROJECT
COMPRESSOR STATION 607

FAIRMOUNT TOWNSHIP, LUZERNE COUNTY, PENNSYLVANIA

SEPTEMBER 2019
(REVISED MAY 2020)

PROJECT OWNER/APPLICANT

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BAI GROUP, LLC
2525 GREEN TECH DRIVE, SUITE D
STATE COLLEGE, PA 16803
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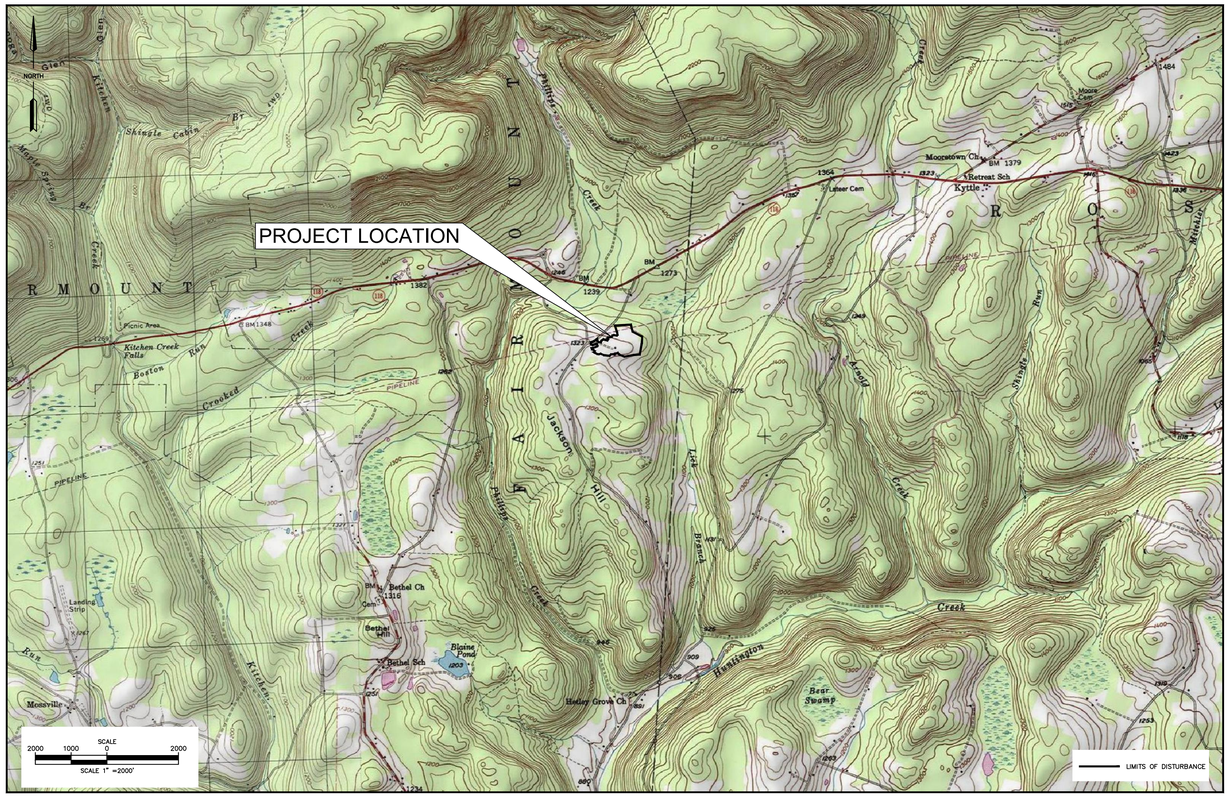
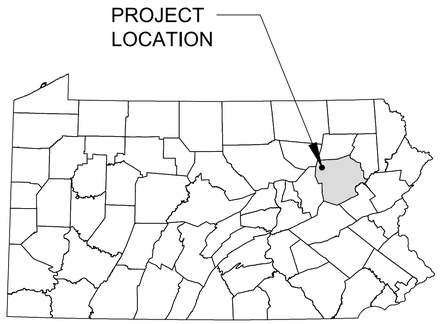
CONTACT: KEVIN C. CLARK, P.E.



LOCATION MAP



VICINITY MAP
N.T.S.

SHEET INDEX	
SHEET NUMBER	DRAWING TITLE
1 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - COVER SHEET
2 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EXISTING CONDITIONS PLAN
3 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - PROPOSED CONDITIONS PLAN
4 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - NOTES
5 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - DETAILS SHEET 1
6 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - DETAILS SHEET 2
7 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - DETAILS SHEET 3

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PENNSYLVANIA ACT 287 (1974) AS AMENDED BY PENNSYLVANIA LESS THAN THREE (3) WORKING DAYS AND NO MORE THAN (10) WORKING DAYS NOTICE TO UTILITIES BEFORE YOU EXCAVATE, DRILL, BLAST OR DEMOLISH.

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PENNSYLVANIA PROFESSIONAL ENGINEER

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
COVER SHEET
FAIRMOUNT TOWNSHIP, LUZERNE COUNTY, PENNSYLVANIA

Williams.

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CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
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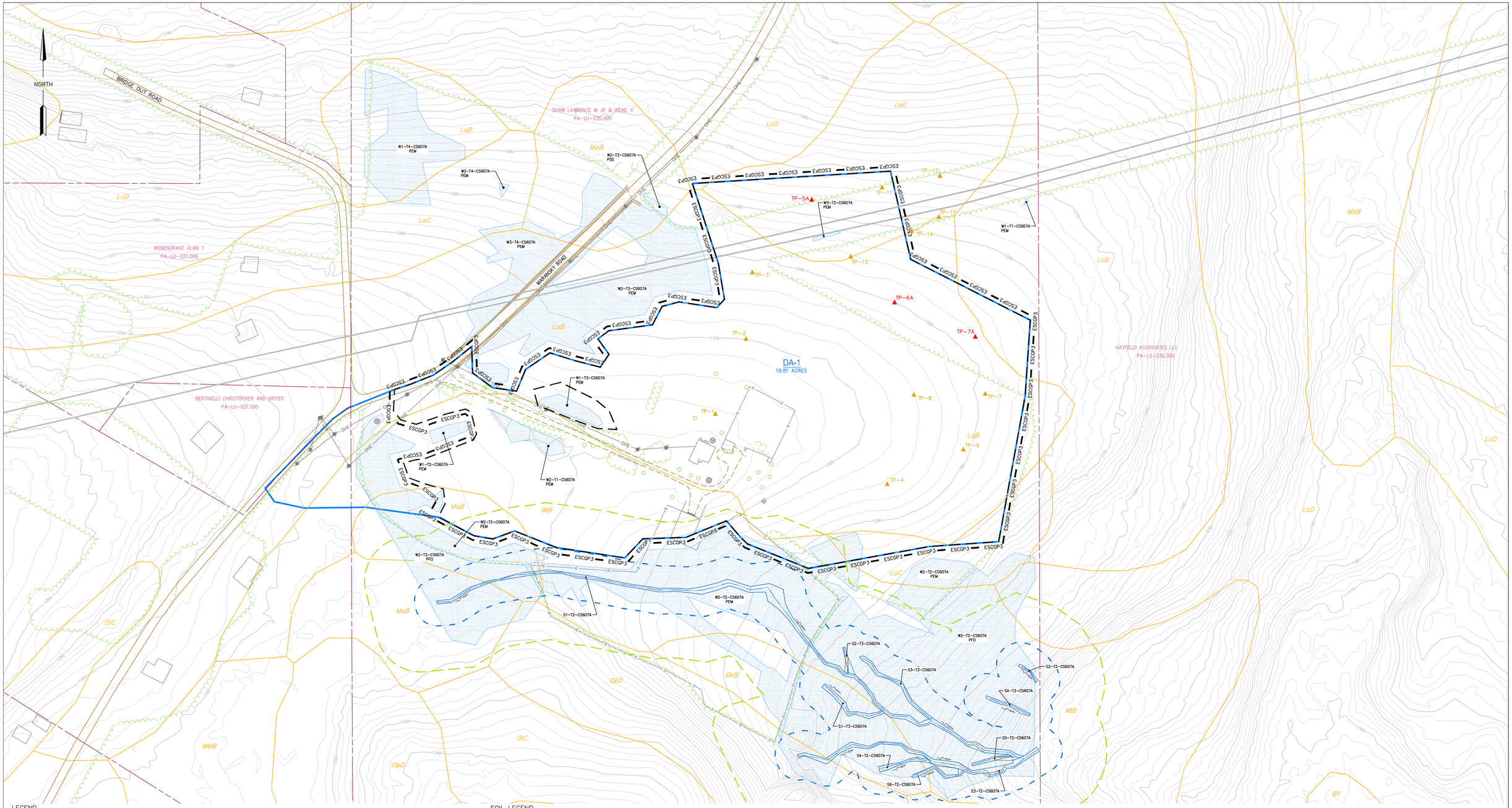
WO: 1211227	RID:		



LEGEND

	PROPERTY LINE	TP-15	SOIL TEST PIT LOCATION (2019)
	EXISTING MINOR CONTOURS (2' C.I.)	TP-7A	SOIL TEST PIT LOCATION (2020)
1200	EXISTING MAJOR CONTOURS (10' C.I.)		
	ESCGP-3 PERMIT BOUNDARY		
	LIMITS OF DISTURBANCE		
	EXISTING LEIDY / TGPL PIPELINES		
	EXISTING FOREIGN PIPELINES		
	EXISTING PIPELINE RIGHT-OF-WAY		
	EXISTING UTILITY POLE / TOWER		
	EXISTING UTILITY LINE		
	EXISTING FENCE		
	EXISTING STRUCTURE		
	EXISTING ROAD (GRAVEL)		
	EXISTING ROAD (PAVED)		
	DELINEATED WETLAND		
	DELINEATED WATERWAY / STREAM (TOP OF BANK)		
	STREAM FLOW DIRECTION		
	RIPARIAN BUFFER		
	50' FLOODWAY		
MrB2	SOIL BOUNDARY / TYPE		
	EXISTING TREELINE / TREE/SHRUB		
	PRE-DEVELOPMENT DRAINAGE AREA		

SOIL LEGEND

LcB	LACKAWANNA CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
LcC	LACKAWANNA CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES
LcB	LACKAWANNA CHANNERY SILT LOAM, 15 TO 25 PERCENT SLOPES
LcD	LACKAWANNA CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES, EXTREMELY STONY
MoB	MORRIS CHANNERY SILT LOAM, 0 TO 8 PERCENT SLOPES
WlB	WELLSBORO CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES

NOTES/SOURCES

1. EXISTING ROADWAYS, CONTOURS, PROPERTY LINE, TREE LINE, ETC. ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 AND JULY 2019.
2. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
3. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
4. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
5. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
6. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
7. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.

SCALE
100 50 0 100
SCALE 1" =100'

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PENNSYLVANIA PROFESSIONAL ENGINEER

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
EXISTING CONDITIONS PLAN

FAIRMOUNT TOWNSHIP LUZERNE COUNTY PENNSYLVANIA

Williams.

DRAWN BY: SWH	DATE: 7/29/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
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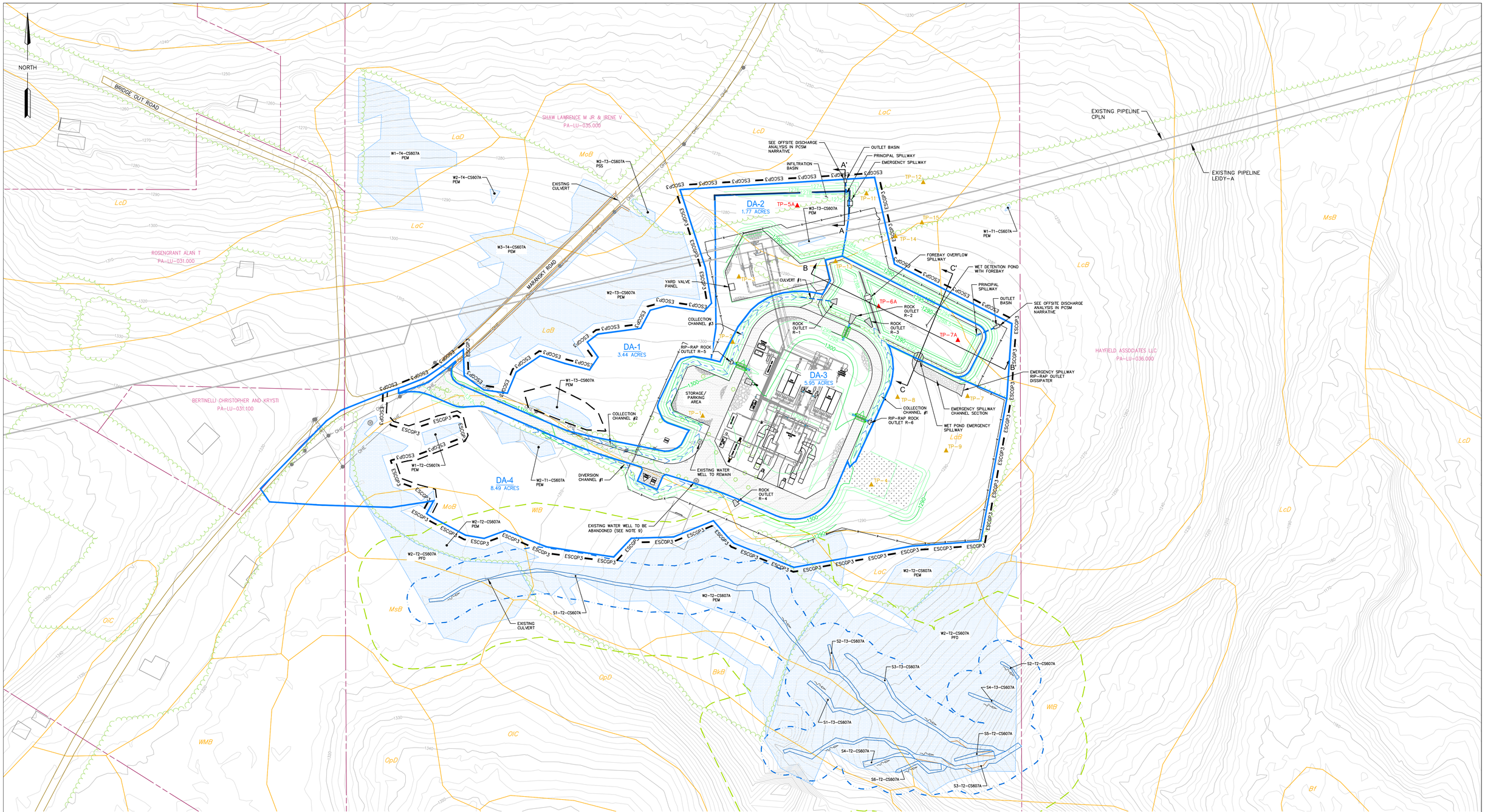
WO: 1211227	RID:		



LEGEND

- PROPERTY LINES
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- COLLECTION CHANNEL
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50' FLOODWAY
- FEMA — FEMA 100-YEAR FLOODPLAIN
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING PIPELINE RIGHT-OF-WAYS
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING MINOR CONTOURS (2' C.I.)
- 780 — EXISTING MAJOR CONTOURS (10' C.I.)
- MoB2 — SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPOSED MINOR CONTOUR (2' C.I.)
- 830 — PROPOSED MAJOR CONTOUR (10' C.I.)
- PROPOSED CULVERT
- PROPOSED FENCE
- 12" CRUSHED STONE (AASHTO #57)
- 4"-6" CRUSHED STONE (AASHTO #57)
- GRASSED AREA
- TP-15 — SOIL TEST PIT LOCATION (2019)
- TP-7A — SOIL TEST PIT LOCATION (2020)
- POST-DEVELOPMENT DRAINAGE AREA
- TRENCH DRAIN
- A — A' — CROSS SECTION LOCATION
- PROPOSED BUILDINGS / EQUIPMENT (APPROX.)

SOIL LEGEND

LaB	LACKAWANNA CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
LaC	LACKAWANNA CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES
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7. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.
8. CONTRACTOR MAY ELECT TO USE DIVERSION CHANNEL OR IF CONDITIONS ALLOW WILL PLACE AN EARTHEN BERM OF APPROPRIATE SIZE THAT WILL CONVEY FLOW TO THE RESPECTIVE DESIGNATED CLEAN WATER CROSSING.

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SCALE 1" =100'

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

Williams.

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
PROPOSED CONDITIONS PLAN
FAIRMOUNT TOWNSHIP LUZERNE COUNTY PENNSYLVANIA

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APPROVED BY: KCC	DATE: 9/20/19		SHEET 3
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 7

RESOLUTION TO SOIL LIMITATIONS

TRANSCO PROPOSES THE FOLLOWING RESOLUTIONS TO COMPENSATE FOR SOIL LIMITATIONS SUMMARIZED IN TABLE 3 ABOVE:

1. TO OFFSET THE CAVING OF CUTBANKS, TRENCHING OPERATIONS WILL BE CONDUCTED IN ACCORDANCE WITH THE OSHA TECHNICAL MANUAL FOR TRENCHING.
2. PREVENTATIVE COATINGS SHALL BE USED TO PREVENT CORROSION OF CONCRETE AND/ OR STEEL.
3. WHEN BEDROCK IS ENCOUNTERED IT WILL BE REMOVED BY MECHANICAL METHODS OR BLASTING. BLASTING WILL CONFORM WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS. THIS IS NOT ANTICIPATED.
4. PRECAUTIONS WILL BE TAKEN TO PREVENT SLOPE FAILURE WHEN WORKING WITHIN LOW STRENGTH SOILS BY FLATTENING CUT / FILL SLOPES, NOT OVERLOADING, MAINTAINING LATERAL SUPPORT, AND PREVENTING SATURATION OF SOILS. USE OF THESE SOILS WILL BE AVOIDED FOR ROADWAY CONSTRUCTION.
5. FOR SOILS PRONE TO FLOODING, SLOW PERCOLATION, PONDING WETNESS, HAVE A SEASONAL HIGH WATER TABLE, OR ARE HYDRIC, EXCAVATIONS IN SOILS THAT HAVE THESE CHARACTERISTICS WILL LIKELY ENCOUNTER WATER, DEWATER WITH APPROPRIATE MEANS SUCH AS PUMP WATER FILTER BAGS, SEDIMENT TRAPS, ETC.
6. SOILS THAT HAVE THE POTENTIAL TO SWELL, SHRINK, OR HEAVE DUE TO FROST ACTION MAY CAUSE DAMAGE TO ROADWAYS OR PADS WHERE FOUNDATIONS ARE CRITICAL REMOVAL AND REPLACEMENT OF SOILS WITH SUITABLE MATERIAL MAY BE REQUIRED.
7. IN SOILS THAT ARE A POOR SOURCE OF TOPSOIL, DROUGHTY OR PRONE TO WETNESS, SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL, WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.
8. FOR THOSE SOILS THAT ARE EASILY ERODIBLE, PROVIDE PROTECTIVE LINING, SEEDING AND MULCHING, EROSION CONTROL BLANKETS (ROLLS OR HYDRAULICALLY APPLIED), TRACKING SLOPES, UPSTREAM DIVERSIONS, WATERBARS, ETC., TO MINIMIZE EROSION OF THE SOILS.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Lackawanna	LaC, LaD, LcB, LcD	X	C	X			X	X	X			X	X				X
Morris	MoB	X	C/S	X	X		X	X	X	X		X	X				X
Wellsboro	WB	X	C/S	X	X		X	X	X	X	X		X				X

CHARACTERISTICS OF EARTH DISTURBANCE ACTIVITY, INCLUDING PAST, PRESENT AND PROPOSED LAND USE PROPOSED ALTERATIONS TO THE AREA

THE LIMIT OF DISTURBANCE WILL BE APPROXIMATELY 18.24 ACRES. USING DATA TAKEN FROM GOOGLE EARTH AND MULTI–RESOLUTION LAND CHARACTERISTICS (MRLC) CONSORTIUM WEBSITE (HTTPS://WWW.MRLC.GOV/VIEWER/), LAND USE FOR THE PAST 20 YEARS HAS BEEN CULTIVATED CROPLAND. BASED ON THE SURROUNDING LAND CHARACTERISTICS, LAND USE WITHIN THE PAST 50 YEARS WOULD HAVE BEEN CROPLAND, FORESTED LAND OR MEADOW. THE COMPRESSOR STATION 607 WILL HAVE TWO GAS TURBINE–DRIVEN COMPRESSOR UNITS AND GAS COOLERS. THE CONSTRUCTION OF THE GRAVEL PAD AND BUILDINGS WILL INCREASE THE VOLUME OF STORMWATER RUNOFF DUE TO THE INCREASE IN THE TYPE AND SIZE OF THE IMPERVIOUS AREA. THE CONTRACTOR WILL USE STORMWATER BMPS TO MITIGATE THE INCREASE IN VOLUME AND PEAK RATES ASSOCIATED WITH CONSTRUCTION. THE PROPOSED BMPS ARE DESIGNED TO EVAPORATE AND INFILTRATE THE NET INCREASE IN VOLUME BETWEEN THE PRE– AND POST–DEVELOPMENT 2–YEAR RAIN EVENTS WITHIN THE PERMIT APPLICATION.

BMP DESCRIPTION NARRATIVE

CONVEYANCE BMPS, A WET DETENTION POND AND AN INFILTRATION BASIN WILL BE INSTALLED ACROSS THE DEVELOPED AREA TO CONVEY THE NET INCREASE IN VOLUME BETWEEN THE PRE AND POST DEVELOPMENT 2–YEAR STORM EVENTS AND MITIGATE THE INCREASE (PRE–POST DEVELOPMENT) IN PEAK RUNOFF FOR THE 2–, 10–, 50–, AND 100–YEAR STORM EVENTS. SEDIMENT BASIN USED AT THE SITE FOR E&S CONTROL WILL BE DEWATERED AND SUBSEQUENTLY REGRADED AS A WET DETENTION POND. A SUMMARY OF THE PROPOSED BMPS IS INCLUDED BELOW:

- COLLECTION CHANNELS WILL BE CONSTRUCTED TO DIRECT A MAJORITY OF THE RUNOFF FROM THE DEVELOPED AREA TO THE WET POND AND INFILTRATION BASIN
- THE 6.5 FT DEEP WET POND WILL HAVE AN INSIDE SLOPE OF 3:1 AND OUTSIDE SLOPE OF 2:1. A FOREBAY WILL BE PROVIDED TO TRAP SEDIMENTS FROM RUNOFF. THE INFILTRATION BASIN WILL HAVE A SIDE SLOPE OF 3:1 AND WILL BE 3' DEEP WITH 1' FREEBOARD. WET POND AND INFILTRATION BASIN BOTH WILL HAVE A PRIMARY OUTLET DEVICE WITH OUTLET BASIN THAT WILL DISCHARGE RUNOFF AS SHEET FLOW.

BMP INSTALLATION SEQUENCE

THE PCSM BMPS SHOULD BE INSTALLED IN A MANNER DESIGNED TO:

1. PROTECT BMP AREAS ASSOCIATED WITH INFILTRATION FROM COMPACTION PRIOR TO AND DURING INSTALLATION.
2. MAINTAIN PROPER EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION.
3. WET DETENTION POND WITH FOREBAY
   a. DEWATER THE SEDIMENT BASIN AND FLUSH OUT THE OUTLET PIPE AND OUTLET BASIN TO CLEAN EXCESS ACCUMULATED SEDIMENT.
   b. REMOVE ANY TEMPORARY RISERS FROM THE BASIN AND INSTALL PERMANENT RISERS
   c. MAKE ANY NECESSARY REPAIRS TO THE BASIN BOTTOM AND INSIDE SLOPES. THIS INCLUDES REPAIRS TO THE 12" COMPACTED SOIL SUBBASE AND/OR 12" TOPSOIL COVER.
   d. REMOVE EXISTING VEGETATION FROM THE BASIN BOTTOM. APPLY EROSION CONTROL MEASURES AS NECESSARY.
   e. AS AREAS ARE COMPLETED, SEED, PLANT AND MULCH IN ACCORDANCE WITH THE SECTION BELOW.
   f. INSTALL ANTI–GRAZING MEASURES, IF NECESSARY
   g. WET POND BOTTOM SHALL BE REVEGETATED WITH ERNST SEEDS ERNMX–128, SEASONALLY FLOODED WILDLIFE FOOD MIX, OR APPROVED EQUAL. WHERE NECESSARY, RESEED AND MULCH INTERIOR SIDESLOPES WITH SAME SEED MIX UTILIZED FOR REVEGETATING THE SEDIMENTATION BASIN.
4. INFILTRATION BASIN
   a. PROTECT INFILTRATION BASIN AREA FROM COMPACTION PRIOR TO INSTALLATION.
   b. EXCAVATE BASIN BOTTOM TO AN UNCOMPACTED SUBGRADE FREE FROM ROCKS AND DEBRIS. DO NOT COMPACT SUBGRADE.
   c. INSTALL OUTLET CONTROL STRUCTURES.
   d. CONSTRUCT AND COMPACT BERMS SURROUNDING THE BASIN SUCH THAT THE SIDE SLOPES ARE NO STEEPER THAN 3:1.
5. SELECT PLANTS THAT ARE WELL ADAPTED TO THE SPECIFIC SITE CONDITIONS. MEADOW PLANTS MUST BE ABLE TO OUT COMPETE WEED SPECIES IN THE FIRST FEW YEARS AS THEY BECOME ESTABLISHED.
6. ALL TEMPORARY E&S BMPS WILL BE REMOVED FOLLOWING SITE STABILIZATION. OTHER EROSION AND SEDIMENT CONTROL MEASURES ARE NOT TO BE REMOVED UNTIL THE SITE IS FULLY STABILIZED.
7. ALL INSTALLED BMPS WILL BE MONITORED UNTIL FINAL SITE STABILIZATION IS ACHIEVED.
8. LONG TERM OPERATION AND MAINTENANCE GUIDELINES DISCUSSED BELOW SHALL BE FOLLOWED.

SEEDING AND MULCHING:

THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER CONSTRUCTION IS COMPLETED. ESTABLISHMENT OF TEMPORARY COVER MUST TAKE PLACE WITHIN 4 DAYS OF CESSATION OF WORK. TEMPORARY EROSION AND SEDIMENTATION CONTROL BMPS CAN BE REMOVED WHEN THE SITE MEETS FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL–DISTURBING ACTIVITIES ARE COMPLETED, AND THAT A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT HARD COVER SUCH AS PAVEMENT OR BUILDINGS HAS STABILIZED THE SURFACE. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE. NO HAY OR STRAW MULCH SHALL BE PLACED ON WATERBODY BANKS. AT A MINIMUM, ALL WATERBODY BANKS SHALL BE COVERED WITH EROSION CONTROL BLANKET. IN ADDITION, ONLY STRAW MULCH SHALL BE USED IN AREAS ADJACENT TO WETLANDS.

TEMPORARY REVEGETATION

AFTER GRADING AND EXCAVATION IS COMPLETED WITHIN AN AREA, VEGETATION WILL BE SOWN PROMPTLY AFTER CEASING EARTHWORK IN THOSE AREAS. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL WILL BE APPLIED TO NEWLY SEEDED AREAS TO PROTECT AGAINST EROSION UNTIL THE VEGETATION IS ESTABLISHED. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL SHALL BE APPLIED AT A RATE OF AT LEAST 3 TONS PER ACRE. EROSION CONTROL BLANKET SHALL BE USED ON STREAM BANKS. NO HAY OR STRAW, MULCH OR BLANKET SHALL BE UTILIZED IN WETLAND AREAS.

PERMANENT SEEDING AND MULCHING

TOPSOIL WILL BE REPLACED PRIOR TO STABILIZATION. DISTURBED AREAS SHALL BE SEEDED WITH A MIXTURE AS OUTLINED IN THE DETAILS PAGES OF THE EROSION AND SEDIMENT CONTROL PLAN SET. APPLY LIME AND FERTILIZER IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS OR AS OUTLINED IN THE BELOW TABLE. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL SHALL BE APPLIED AT A RATE OF AT LEAST 3 TONS PER ACRE.

TABLE 11.2
Soil Amendment Application Rate Equivalents

Soil Amendment	Permanent Seeding Application Rate			Notes
	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	
Agricultural lime	6 tons	240 lb.	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-20-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields
	Temporary Seeding Application Rate			
Agricultural lime	1 ton	40 lb.	410 lb.	Typically not required for topsoil stockpiles
10-10-10 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for topsoil stockpiles

Adapted from Penn State, "Erosion Control and Conservation Plantings on Noncropland"

NOTE: A compost blanket which meets the standards of this chapter may be substituted for the soil amendments shown in Table 11.2.

TABLE 11.3
Plant Tolerances of Soil Limitation Factors

Species	Growth Habit[1]	Wet Soil	Dry Site	Low Fertility	Acid Soil (pH 5-5.5)[2]	Purity (%)	Ready Germ (%)	Hard Seed (%)	Total Germ (%)	Seeds/lb (1,000s)
		Tolerates				Minimum Seed Specifications[3]				
Warm-Season Grasses										
Deertongue	bunch	yes	yes	yes	yes	95	75		75	250
Weeping lovegrass	bunch	no	yes	yes	yes	97	75		75	1,500
Switchgrass[4]	bunch	yes	yes	yes	yes	(60 PLS)				390
Big bluestem	bunch	no	yes	yes	yes	(60 PLS)				150
Cool-Season Grasses										
Tall Fescue	bunch	yes	no	yes	no	95	80		80	227
Redtop	sod	yes	yes	yes	yes	92	80		80	5,000
Fine fescues	sod	no	no	yes	no	95	80		80	400
Perennial ryegrass	bunch	yes	no	no	no	95	85		85	227
Annual ryegrass	bunch	yes	no	yes	no	95	85		85	227
Kentucky bluegrass	sod	no	no	no	no	85	75		75	2,200
Reed canarygrass	sod	yes	yes	yes	no	95	70		70	520
Orchardgrass	bunch	yes	yes	yes	yes	95	80		80	654
Timothy	bunch	yes	no	yes	yes	95	80		80	1,230
Smooth bromegrass	sod	no	yes	yes	no	95	80		80	136
Legumes[5]										
Birdsfoot trefoil[6]	bunch	yes	no	yes	yes	98	60	20	80	400
Flatpea	sod	no	no	yes	yes	98	55	20	75	10
Serecia lespedeza	bunch	no	yes	yes	yes	98	60	20	80	335
Cereals										
Winter wheat	bunch	no	no	no	no	98	85		85	15
Winter rye	bunch	no	no	yes	yes	98	85		85	18
Spring oats	bunch	no	no	no	no	98	85		85	13
Sundangrass	bunch	no	yes	no	no	98	85		85	55
Japanese millet	bunch	yes	no	yes	yes	98	80		80	155

[1] Growth habit refers to the ability of the species to either form a dense sod by vegetative means (stolons, rhizomes, or roots) or remain in a bunch or single plant form. If seeded heavily enough, even bunch formers can produce a very dense stand. This is sometimes called a sod, but not in the sense of a sod formed by vegetative means.

[2] Once established, plants may grow at a somewhat lower pH, but cover generally is only adequate at pH 6.0 or above.

[3] *Minimum seed lots are truly minimum, and seed lots to be used for revegetation purposes should equal or exceed these standards.* Thus, deertongue grass should germinate 75% or better. Crownvetch should have at least 40% readily germinable seed and 30% hard seed. Commonly, seed lots are available that equal or exceed minimum specifications. Remember that disturbed sites are adverse for plant establishment. Ready germination refers to seed that germinates during the period of the germination test and that would be expected, if conditions are favorable, to germinate rapidly when planted. The opposite of ready germination is dormant seed, of which hard seed is one type.

[4] Switchgrass seed is sold only on the basis of PLS.

[5] Need specific legume inoculant. Inoculant suitable for garden peas and sweetpeas usually is satisfactory for flatpea.

[6] Birdsfoot trefoil is adapted over the entire state, except in the extreme southeast where crown and root rots may injure stands.

Penn State, "Erosion Control and Conservation Plantings on Noncropland,"

ERNST RIPARIAN BUFFER MIX - ERNMX 178

PERCENTAGE OF MIX COMPOSITION	SCIENTIFIC NAME	COMMON NAME
30.0%	*PANICUM CLANDESTINUM*	DEERTONGUE
20.0%	*ELYMUS VIRGINICUS*	VIRGINIA WILDRYE
11.8%	*ANDROPOGON GERARDII*	BIG BLUESTEM
10.5%	*SORGHASTRUM NUTANS*	INDIANAGRASS
5.0%	*PANICUM VIRGATUM*	SWITCHGRASS
4.0%	*CHAMAECRISTA FASCICULATA*	PARTRIDGE PEA
4.0%	*VERBENA HASTATA*	BLUE VERVAIN
3.0%	*JUNCUS EFFUSUS*	SOFT RUSH
3.0%	*RUDBECKIA HIRTA*	BLACKEYED SUSAN
2.0%	*HELIOPSIS HELIANTHOIDES*	OXEYE SUNFLOWER
1.0%	*ASCLEPIAS INCARNATA*	SWAMP MILKWEED
0.7%	*ASTER NOVAE-ANGLIAE*	NEW ENGLAND ASTER
0.7%	*ASTER UMBELLATUS*	FLAT TOPPED WHITE ASTER
0.7%	*EUPATORIUM PERFOLIATUM*	BONESET
0.5%	*AGROSTIS PERENNANS*	AUTUMN BENTGRASS
0.5%	*HELENIUM AUTUMNALE*	COMMON SNEEZEWEED
0.5%	*MONARDA FISTULOSA*	WILD BERGAMOT
0.5%	*VERNONIA NOVEBORACENSIS*	NEW YORK IRONWEED
0.4%	*PYCNANTHEMUM TENUIFOLIUM*	NARROWLEAF MOUNTAINMINT
0.4%	*SOLIDAGO PATULA*	ROUGHLEAF GOLDENROD
0.3%	*EUPATORIUM FISTULOSUM*	JOE PYE WEED
0.3%	*LOBELIA SIPHILITICA*	GREAT BLUE LOBELIA
0.2%	*ASTER PUNICEUS*	PURPLESTEM ASTER

1. SEEDING RATE: 20 LBS/ACRE WITH A COVER CROP AT 30 LBS/ACRE
2. THIS SEED MIX IS TO BE USED TO REVEGETATE WORKSPACE WITHIN THE DESIGNATED 150' RIPARIAN BUFFER AREA WHERE SLOPES ARE LESS THAN 10%. IF THE SLOPE EXCEEDS 10%, A STANDARD UPLAND ROW MIX SHOULD BE USED.
3. AN ALTERNATIVE SEED MIXTURE THAT CONTAINS SIMILAR SPECIES IS ACCEPTABLE.

TABLE 11.4
Recommended Seed Mixtures

Mixture Number	Species	Seeding Rate - Pure Live Seed[1] Most Sites	Adverse Sites
1[2]	Spring oats (spring), or Annual ryegrass (spring or fall), or Winter wheat (fall), or Winter rye (fall)	64 10 90 56	96 15 120 112
2[3]	Tall fescue, or Fine fescue, or Kentucky bluegrass, plus Redtop[4], or Perennial ryegrass	60 35 25 3 15	75 40 30 3 20
3	Birdsfoot trefoil, plus Tall fescue	6 30	10 35
4	Birdsfoot trefoil, plus Reed canarygrass	6 10	10 15
8	Flatpea, plus Tall fescue, or Perennial ryegrass	20 20 20	30 30 25
9[6]	Serecia lespedeza, plus Tall fescue, plus Redtop[4]	10 20 3	20 25 3
10	Tall fescue, plus Fine fescue	40 10	60 15
11	Deertongue, plus Birdsfoot trefoil	15 6	20 10
12[7]	Switchgrass, or Big Bluestem, plus Birdsfoot trefoil	15 15 6	20 20 10
13	Orchardgrass, or Smooth bromegrass, plus Birdsfoot trefoil	20 25 6	30 35 10

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. PLS is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds PLS shown on the seed tag. Thus, if the PLS content of a given seed lot is 35%, divide 12 PLS by 0.35 to obtain 34.3 pounds of seed required to plant one acre. All mixtures in this table are shown in terms of PLS.
2. If high-quality seed is used, for most sites seed spring oats at a rate of 2 bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at 1 bushel per acre. If germination is below 90%, increase these suggested seeding rates by 0.5 bushel per acre.
3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.
4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.
5. Use for highway slopes and similar sites where the desired species after establishment is crownvetch.

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PCSM CRITICAL STAGES

A SCHEDULE OF VISITS FOR THE LICENSED PROFESSIONAL OR DELEGATE IS PROVIDED BELOW. CRITICAL POINTS WHICH WILL REQUIRE VISITS AT A MINIMUM ARE LISTED AS FOLLOWS:

1. FOR THE FINAL GRADING AND SEEDING OF THE COLLECTION CHANNELS, WET POND AND INFILTRATION BASIN ENSURING IT IS CONSTRUCTED ACCORDING TO THE PLAN DETAILS FOR PROPER COLLECTION, INFILTRATION, AND CONVEYANCE OF RUNOFF. ACCUMULATED SEDIMENT SHOULD BE CLEANED OUT SO THE BASIN HAS THE NECESSARY DESIGN VOLUME.
2. FOR THE LAYOUT AND EXCAVATION OF THE OUTLET STRUCTURES, THE PROFESSIONAL OR DELEGATE WILL ENSURE SIZING, MATERIALS SPECIFICATIONS, AND CONSTRUCTION PROCEDURES ARE FOLLOWED TO ENABLE PROPER STORAGE AND DISCHARGE TO THE POND/BASIN.
3. FOR FINAL INSPECTION OF CONSTRUCTED BMPS.
4. AT THE ESTABLISHMENT OF HARD SURFACE STABILIZATION OR 70% VEGETATION COVERS TO ALLOW REMOVAL OF E AND S CONTROLS.

LONG TERM OPERATION AND MAINTENANCE SCHEDULE

ALL BMPS SHOULD BE PROPERLY MAINTAINED TO ENSURE THEIR EFFECTIVENESS. SHEET FLOW CONDITIONS AND INFILTRATION MUST BE SUSTAINED THROUGHOUT THE LIFE OF THE BMP. INSPECT BMPS FOR CLOGGING FROM SEDIMENT OF DEBRIS, DAMAGE BY FOOT OR VEHICULAR TRAFFIC, AND FLOW CHANNELIZATION. INSPECTIONS SHOULD BE MADE ON A QUARTERLY BASIS FOR THE FIRST TWO YEARS FOLLOWING INSTALLATION, AND THEN TWICE PER YEAR THEREAFTER. INSPECTIONS SHOULD ALSO BE MADE AFTER EVERY STORM EVENT GREATER THAN 1 INCH DURING THE ESTABLISHMENT PERIOD.

OPERATION AND MAINTENANCE GUIDELINES SHOULD BE PROVIDED TO ALL FACILITY OWNERS AND TENANTS. SEDIMENT AND DEBRIS SHOULD BE ROUTINELY REMOVED UPON OBSERVATION. IF EROSION IS OBSERVED, MEASURES SHOULD BE TAKEN TO IMPROVE DISPERSION METHOD TO ADDRESS THE SOURCE OF EROSION.

CHANNEL LINING WILL BE INSPECTED FOR SIGNS OF EROSION OR DISLODGING, AS APPLICABLE. CHANNEL WILL BE INSPECTED FOR DEBRIS, OVERGROWN VEGETATION, AND OTHER BLOCKAGES.

DURING THE FIRST GROWING SEASON, WET POND VEGETATION SHOULD BE INSPECTED EVERY 2 TO 3 WEEKS. UNDESIRABLE SPECIES SHOULD BE CAREFULLY REMOVED, AND REPLACEMENTS PLANTED IF NECESSARY. WET PONDS AND POND DRAINS SHOULD BE INSPECTED AT LEAST 4 TIMES PER YEAR AND AFTER MAJOR STORMS (GREATER THAN 2 INCHES IN 24 HOURS). SEDIMENT SHOULD BE REMOVED FROM THE FOREBAY BEFORE IT OCCUPIES 50% OF THE FOREBAY, TYPICALLY EVERY 5 TO 10 YEARS. SEDIMENT SHOULD BE REMOVED WHEN THE BMP IS THOROUGHLY DRY. TRASH AND DEBRIS REMOVED FROM THE SITE SHOULD BE DEPOSITED ONLY AT SUITABLE DISPOSAL/RECYCLING SITES AND MUST COMPLY WITH APPLICABLE LOCAL, STATE, AND FEDERAL WASTE REGULATIONS. SEDIMENT SHOULD BE REMOVED WHEN THE BMP IS THOROUGHLY DRY. TRASH AND DEBRIS REMOVED FROM THE SITE SHOULD BE DEPOSITED ONLY AT SUITABLE DISPOSAL/RECYCLING SITES AND MUST COMPLY WITH APPLICABLE LOCAL, STATE, AND FEDERAL WASTE REGULATIONS.

GRASS COVER SHOULD BE MOWED WITH LOW GROUND PRESSURE EQUIPMENT AS NEEDED TO CONTROL NOXIOUS WEEDS. MOWING SHOULD BE DONE ONLY WHEN THE SOIL IS DRY IN ORDER TO PREVENT TRACKING DAMAGE TO VEGETATION, SOIL COMPACTION, AND FLOW CONCENTRATIONS. IF VEGETATIVE COVER IS NOT FULLY ESTABLISHED WITHIN THE DESIGNATED TIME, IT SHOULD BE REPLACED WITH AN ALTERNATIVE SPECIES. UNWANTED OR INVASIVE GROWTH SHOULD BE REMOVED ON AN ANNUAL BASIS.

VEGETATED AREAS WILL BE INSPECTED WEEKLY AND AFTER RUNOFF EVENTS UNTIL PERMANENT VEGETATION IS ACHIEVED. ONCE THE VEGETATION IS ESTABLISHED, INSPECTIONS OF HEALTH, DIVERSITY, AND DENSITY SHOULD BE PERFORMED AT LEAST TWICE PER YEAR, DURING BOTH THE GROWING AND NON–GROWING SEASON. VEGETATIVE COVER SHOULD BE SUSTAINED AT 85% AND REESTABLISHED IF DAMAGE GREATER THAN 50% IS OBSERVED.

DAMAGED BMPS WILL BE REPAIRED AS SOON AS POSSIBLE UPON DISCOVERY. REPAIRS WILL BE MADE TO RESTORE TO BMPS TO THE ORIGINAL DESIGN CONDITION.

WET POND SHOULD BE INSPECTED AT LEAST 4 TIMES PER YEAR AND AFTER MAJOR STORMS (> 2 INCHES PER 24 HOURS) OR RAPID ICE BREAKUP. THE POND DRAIN SHOULD BE INSPECTED AND TESTED 4 TIMES PER YEAR.

MATERIAL RECYCLING AND DISPOSAL

IF THE SITE WILL NEED TO HAVE FILL IMPORTED FROM AN OFF–SITE LOCATION, THE RESPONSIBILITY FOR PERFORMING ENVIRONMENTAL DUE DILIGENCE AND THE DETERMINATION OF CLEAN FILL WILL IN MOST CASES RESIDE WITH THE OPERATOR.

IF THE SITE WILL HAVE EXCESS FILL THAT WILL NEED TO BE EXPORTED TO AN OFF–SITE LOCATION, THE RESPONSIBILITY OF CLEAN FILL DETERMINATION AND ENVIRONMENTAL DUE DILIGENCE RESTS ON THE APPLICANT.

IF ALL CUT AND FILL MATERIALS WILL BE USED ON THE SITE, A CLEAN FILL DETERMINATION IS NOT REQUIRED BY THE OPERATOR UNLESS THERE IS A BELIEF THAT A SPILL OR RELEASE OF A REGULATED SUBSTANCE OCCURRED ON SITE.

APPLICANTS AND/OR OPERATORS MUST USE ENVIRONMENTAL DUE DILIGENCE TO ENSURE THAT THE FILL MATERIAL ASSOCIATED WITH THIS PROJECT QUALIFIES AS CLEAN FILL. DEFINITIONS OF CLEAN FILL AND ENVIRONMENTAL DUE DILIGENCE ARE PROVIDED BELOW. ALL FILL MATERIAL MUST BE USED IN ACCORDANCE WITH THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL", DOCUMENT NUMBER 258 2182 773. A COPY OF THIS POLICY IS AVAILABLE ONLINE AT WWW.DEPWEB.STATE.PA.US.

CLEAN FILL IS DEFINED AS: UNCONTAMINATED, NON–WATER SOLUBLE, NON–DECOMPOSABLE, INERT, SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED. (THE TERM "USED ASPHALT" DOES NOT INCLUDE MILLED ASPHALT OR ASPHALT THAT HAS BEEN PROCESSED FOR RE–USE.).

ENVIRONMENTAL DUE DILIGENCE: INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF PROPERTY OWNERSHIP, REVIEW OF PROPERTY USE HISTORY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS. ANALYTICAL TESTING IS NOT A REQUIRED PART OF DUE DILIGENCE UNLESS VISUAL INSPECTION AND/OR REVIEW OF THE PAST LAND USE OF THE PROPERTY INDICATES THAT THE FILL MAY HAVE BEEN SUBJECTED TO A SPILL OR RELEASE OF REGULATED SUBSTANCE. IF THE FILL MAY HAVE BEEN AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE, IT MUST BE TESTED TO DETERMINE IF IT QUALIFIES AS CLEAN FILL. TESTING SHOULD BE PERFORMED IN ACCORDANCE WITH APPENDIX A OF THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL".

FILL MATERIAL THAT DOES NOT QUALIFY AS CLEAN FILL IS REGULATED FILL. REGULATED FILL IS WASTE AND MUST BE MANAGED IN ACCORDANCE WITH THE DEPARTMENT'S MUNICIPAL OR RESIDUAL WASTE REGULATIONS BASED ON 25 PA. CODE CHAPTERS 287 RESIDUAL WASTE MANAGEMENT OR 271 MUNICIPAL WASTE MANAGEMENT, WHICHEVER IS APPLICABLE.

THERMAL IMPACTS

DUE TO THE OVERALL NATURE OF THE PROJECT, THERMAL IMPACTS TO SURFACE WATERS ARE NOT ANTICIPATED. THE PRIMARY MEANS TO ADDRESS THERMAL IMPACTS ON THIS PROJECT IS TO LIMIT THE SIZE AND DURATION OF EXPOSED EARTH.

STORMWATER RUNOFF ASSOCIATED WITH THE INSTALLATION OF THE COMPRESSOR UNITS WILL BE ROUTED THROUGH THE STORMWATER BMP'S DESIGNED TO RETAIN AND INFILTRATE THE FIRST SURGE OF WATER FROM THE SITE. THE FIRST SURGE OF WATER WILL BE THE WARMEST WATER FOR THE DURATION OF THE STORM EVENT AND WILL QUICKLY COOL AS THE STORM EVENT PROGRESSES. THE BMPS ARE DESIGNED TO CAPTURE AND INFILTRATE THIS WARMEST SURGE OF STORMWATER. BASED ON ROUTING CALCULATIONS, STORMWATER IS NOT DISCHARGED FROM THE BMPS FOR THE FIRST 12 HOURS DURING A 100–YEAR/24–HOUR STORM EVENT. THE RETENTION PERIOD IS LONGER FOR LESS INTENSE STORMS. THEREFORE, THROUGH THESE MEASURES, THERE IS NO SIGNIFICANT THERMAL IMPACT TO THE RECEIVING WATERS ANTICIPATED.

ANTIDEGRADATION REQUIREMENTS

THE SITE IS LOCATED IN HIGH QUALITY WATERSHED AND CONSTRUCTION ACTIVITIES AT THE SITE WILL RESULT IN INCREASED DISCHARGE OF STORMWATER TO SURFACE WATERS. THE EROSION AND SEDIMENT CONTROL PLAN PREPARED FOR THE SITE OUTLINES A MORE STRINGENT DESIGN AND E&S BMPS THAT MEET ABACT STANDARDS. WITH REGARD TO WATERS IDENTIFIED AS SPECIAL PROTECTION UNDER CHAPTER 93 (HQ–CWF AND EV), THE FOLLOWING IS A WRITTEN DEMONSTRATION OUTLINING HOW THE PROJECT IS MEETING THE ANTIDEGRADATION REQUIREMENTS FOUND WITHIN CHAPTER 93 AND 102.

TRANSCO EVALUATED THE FEASIBILITY ON NON–DISCHARGE ALTERNATIVES SUCH AS ALTERNATIVE SITE LOCATION, LIMITING DISTURBED AREA AND PROTECTING RIPARIAN BUFFERS. THE LOCATION WAS CHOSEN SUCH THAT DISTURBANCE TO SURROUNDING AREAS AND SENSITIVE FEATURES SUCH AS RIPARIAN BUFFERS WAS MINIMIZED. THE EXISTING / DESIGNATED USE OF THE STREAMS WITHIN THE PROJECT AREA ARE TO BE PROTECTED THROUGH E&S AND PCSM MEASURES TAKEN BY TRANSCO. PROPOSED INFILTRATION BMPS ARE DESIGNED WITH STORMWATER VOLUME REDUCTION AND WATER QUALITY TREATMENT MAXIMIZED TO THE EXTENT PRACTICABLE WITHIN THE SITE CONSTRAINTS TO MAINTAIN AND PROTECT EXISTING WATER QUALITY AND EXISTING AND DESIGNATED USES. STORMWATER BMPS WILL BE DESIGNED TO MEET THE ANTIDEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES (ABACT) STANDARDS AS OUTLINED BY THE PA DEP E&S MANUAL GUIDANCE (MARCH 2012). COMPOST FILTER SOCKS, WHICH IS AN ABACT BMP, WILL BE USED ACROSS THE SITE TO PREVENT SEDIMENTS FROM REACHING ADJACENT SURFACE WATERS. EARTH DISTURBANCE WILL BE MINIMIZED TO THE EXTENT PRACTICAL AND WILL BE PHASED OR SEQUENCED TO ONLY DISTURBED PORTIONS THAT ARE NECESSARY FOR THE SPECIFIC SCOPE OF WORK. ALSO, IMMEDIATE STABILIZATION WILL TAKE PLACE WHEN EARTHWORK COMMENCES WITHIN A SPECIFIC AREA. WHEREVER POSSIBLE, THE LOD WAS DECREASED TO AVOID DISTURBING ADDITIONAL GROUND AND WILL BE KEPT TO THE MINIMUM WIDTH AND DEPTH NECESSARY TO SAFELY COMPLETE CONSTRUCTION ACTIVITIES.

RIPARIAN BUFFERS

TEMPORARY WORKSPACE ASSOCIATED WITH COMPRESSOR STATION 607 IS LOCATED WITHIN THE NON–FORESTED RIPARIAN BUFFER OF STREAM S1–T2–607A. AFTER COMPLETING THE CONSTRUCTION ACTIVITIES, THE IMPACTED RIPARIAN AREA WILL BE RESTORED BACK TO PRE–EXISTING CONTOURS AND RE–SEEDED WITH A RIPARIAN SEED MIX.

THE PCSM PLAN SHALL BE PREPARED BY A PERSON TRAINED AND EXPERIENCED IN EROSION CONTROL METHODS AND TECHNIQUES

THESE PLANS AND NARRATIVE WERE PREPARED BY BY KEVIN C. CLARK, PE (BAI GROUP, LLC) OF STATE COLLEGE, PA IN ACCORDANCE WITH THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION STORMWATER BMP MANUAL, DECEMBER, 2006. THE PLAN PREPARER'S RESUME IS PROVIDED IN THE PERMIT APPLICATION).

NON–STRUCTURAL AND STRUCTURAL WATER QUALITY BMP DESCRIPTION

1. LIMIT OF DISTURBANCE WILL BE MINIMIZED TO THE MAXIMUM EXTENT POSSIBLE BY DISTURBING ONLY THOSE AREAS NECESSARY TO COMPLETE THE PROPOSED EARTHWORK AND BMP INSTALLATIONS.
2. SENSITIVE FEATURES SUCH AS WETLANDS AND RIPARIAN BUFFERS WILL BE PROTECTED TO THE MAXIMUM EXTENT POSSIBLE. THESE AREAS WILL BE CLEARLY DELINEATED IN THE FIELD AND PROTECTED PRIOR TO ANY CONSTRUCTION ACTIVITIES TAKING PLACE. EXISTING VEGETATION IS NOT TO BE REMOVED FROM THE PROTECTED AREA AND THE AREAS SHALL NOT BE SUBJECT TO GRADING OR MOVEMENT OF EXISTING SOILS. ANY PROTECTED AREAS THAT HAVE BEEN DISTURBED/COMPACTED DURING CONSTRUCTION WILL BE RESTORED USING SOIL AMENDMENT AND RESTORATION.
3. TEMPORARILY IMPACTED RIPARIAN BUFFER WILL BE FULLY RESTORED TO ITS PREEXISTING CONDITIONS
4. DISTURBED AREAS THAT ARE NOT PROPOSED TO BE IMPERVIOUS WILL BE REVEGETATED AS PER THE SEEDING AND MULCHING NOTES PROVIDED IN PCSM PLAN NOTES.
5. WET DETENTION POND WILL ACT AS A WATER QUALITY BMP. RELATIVELY STEEPER SLOPES ARE UTILIZED FOR THE WET POND EMBANKMENTS TO MINIMIZE DISTURBED AREA.
6. WHEREVER POSSIBLE, EXISTING NATURAL DRAINAGE PATTERNS WILL BE UTILIZED TO DIVERT FLOW TO THE PROPOSED INFILTRATION BASIN.
7. STREET SWEEPING WILL BE DONE NEAR THE SITE ENTRANCE ON MARANSKY ROAD.

WHM consulting, INC. designs, permits, resolutions | BAI GROUP

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COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 041211-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN TO AVOID / MINIMIZED WETLAND IMPACTS AND PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

Williams.

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
NOTES
FAIRMOUNT TOWNSHIP, LUZERNE COUNTY, PENNSYLVANIA

DRAWN BY: SWH	DATE: 7/29/19	ISSUED FOR BID:	SCALE:
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 4 OF 7
WO: 1211227	RID:		

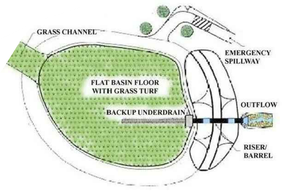


Figure 6.2-1. Schematic design of constructed infiltration basin with concrete level spreader (Schueler)

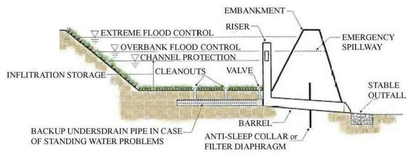
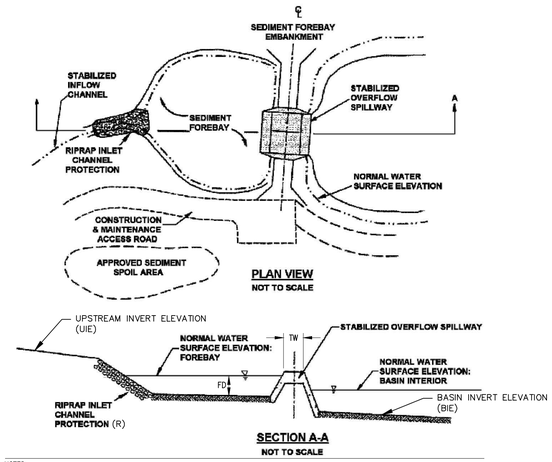


Figure 6.2-2. Cross section schematic of infiltration basin (Schueler)

INSIDE SLOPE	OUTSIDE SLOPE	BASE ELEVATION (FT)	RISER CREST ELEVATION (FT)	TOTAL BASIN DEPTH (FT)	RISER PIPE DIAMETER (IN)	SPILLWAY BASE WIDTH (FT)	SHWT (INCHES BELOW GROUND)	BED ROCK(INCHES BELOW GROUND)
3:1	2:1	1275.0	1278.0	4	8	18	26"	Not Encountered

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
KEVIN CLARK, P.E.
IB INFILTRATION BASIN
Williams



NOTES:

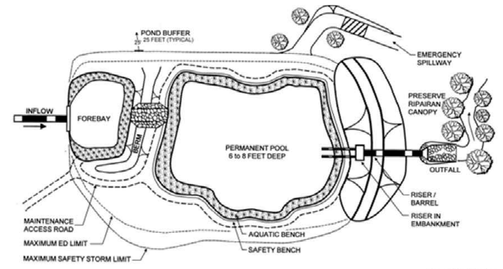
THE OVERFLOW SPILLWAY OF A FOREBAY SHOULD NOT BE A FLOW-THROUGH SPILLWAY. THE BERM SHOULD BE CONSTRUCTED OF NON-PERMEABLE SOILS OR CONCRETE. WHERE SOILS ARE USED, A SUITABLE TYPE OF HARD ARMOR SHOULD BE PROVIDED TO PREVENT SCOUR DURING OVERFLOW.

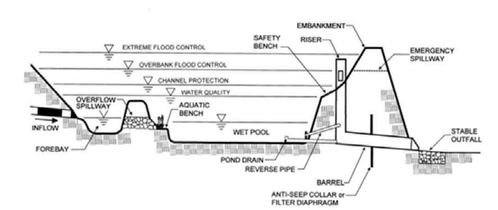
WHERE NEEDED, FOREBAY EFFICIENCY CAN OFTEN BE INCREASED BY THE PROPER USE OF FLOCCULANTS. MANUFACTURER'S RECOMMENDATIONS SHOULD BE STRICTLY FOLLOWED TO MAXIMIZE EFFICIENCY OF THE FLOCCULANT AND PREVENT CHEMICAL CONTAMINATION.

SEDIMENT FOREBAY DEPTH(FT) (FD)	FOREBAY SPILLWAY TOP WIDTH(FT) (TW)	RIPRAP INLET ROCK SIZE(IN) (R)	RIPRAP INLET THICKNESS(IN)	UPSTREAM INVERT(FT) (UIE)	BASIN INVERT (BIE)
4	2	3	9	1292.0	1288.5

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
SF TYPICAL SEDIMENT FOREBAY
Williams

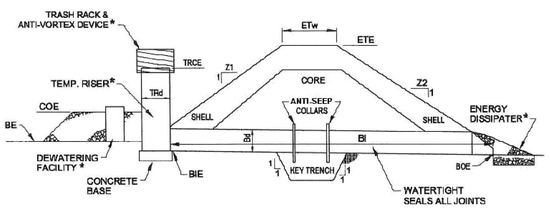




BASE ELEVATION [FT]	TOP ELEVATION [FT]	INSIDE SLOPE	OUTSIDE SLOPE	BASE WIDTH [FT]	BASE LENGTH [FT]	TOTAL DEPTH [FT]	SHWT (INCHES BELOW GROUND)	BED ROCK(INCHES BELOW GROUND)
1288.5	1295	3	3	76	356	6.5	18"	Not Encountered

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WDP WET DETENTION POND WITH FOREBAY
Williams



BASIN NO.	Z1 (FT)	Z2 (FT)	TEMPORARY RISER DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	BARREL DIA Bd (IN)	INLET ELEV BIE (FT)	MAT'L	LENGTH (FT)	OUTLET ELEV BOE (FT)
1	3	2	20	1292.5	CMP	15	1289.5	CMP	100	1289.0

EMBANKMENT TOP ELEV ETE (FT)	TOP WIDTH ETw (FT)	KEY TRENCH DEPTH (FT)	KEY TRENCH WIDTH (FT)	CLEANOUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
1295.0	8	2	4	1289.5	1288.5

NOTES:

*ALSO REFER TO SEDIMENT BASIN TEMPORARY RISER, EMERGENCY SPILLWAY, ENERGY DISSIPATER, TRASH RACK AND ANTI-VORTEX DEVICE, AND SEDIMENT STORAGE DEWATERING FACILITY DETAILS.

SEDIMENT BASINS, INCLUDING ALL APPURTENANT WORKS, SHALL BE CONSTRUCTED TO THE DETAIL AND DIMENSIONS SHOWN ON THE E&S PLAN DRAWINGS.

AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO A DEPTH OF TWO FEET PRIOR TO ANY PLACEMENT AND COMPACTION OF EARTHEN FILL. FILL MATERIAL FOR THE EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIALS. THE EMBANKMENT SHALL BE COMPACTED IN LAYERED LIFTS OF NOT MORE THAN 6" TO 9". THE MAXIMUM ROCK SIZE SHALL BE NO GREATER THAN ⅔ THE LIFT THICKNESS. UPON COMPLETION, THE EMBANKMENT SHALL BE SEEDED AND MULCHED OR OTHERWISE STABILIZED ACCORDING TO THE SPECIFICATIONS OF THE E&S PLAN DRAWINGS. TREES SHALL NOT BE PLANTED ON THE EMBANKMENT.

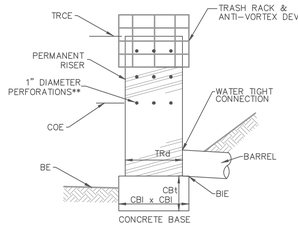
ACCESS SHALL BE PROVIDED FOR SEDIMENT REMOVAL AND OTHER REQUIRED MAINTENANCE ACTIVITIES.

A CLEAN OUT STAKE SHALL BE PLACED NEAR THE CENTER OF EACH BASIN. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT HAS REACHED THE CLEAN OUT ELEVATION ON THE STAKE AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS. DISPOSE OF MATERIALS REMOVED FROM THE BASIN IN THE MANNER DESCRIBED IN THE E&S PLAN.

WET POND SHOULD BE INSPECTED AT LEAST 4 TIMES PER YEAR AND AFTER MAJOR STORMS (> 2 INCHES PER 24 HOURS) OR RAPID ICE BREAKUP. THE POND DRAIN SHOULD BE INSPECTED AND TESTED 4 TIMES PER YEAR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WPE WET POND EMBANKMENT AND SPILLWAY DETAILS – PERFORATED RISER
Williams



* SEE STANDARD CONSTRUCTION DETAIL #7-5, TRASH RACK AND ANTI-VORTEX DEVICE
** LOWEST ROW OF HOLES AT SEDIMENT CLEAN-OUT ELEVATION

BASIN NO.	PERMANENT RISER DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	PERFORATIONS LOWEST ROW OF HOLES ELEV (FT)	NO. ROWS**	NO. HOLES PER ROW	VERT. SPACING OF ROWS (FT)	CONCRETE BASE LENGTH AND WIDTH CBl (IN)	THICKNESS CBt (IN)	BARREL INLET ELEV BIE (FT)
1	20	1292.5	CMP	1289.5	3	3	1	40	12	1289.5

NOTES:

*SEE STANDARD CONSTRUCTION DETAIL #7-5, TRASH RACK AND ANTI-VORTEX DEVICE
**LOWEST ROW OF HOLES AT SEDIMENT CLEAN-OUT ELEVATION.

A MINIMUM 2 #8 REBAR SHALL BE PLACED AT RIGHT ANGLES AND PROJECTING THROUGH SIDES OF RISER TO ANCHOR IT TO CONCRETE BASE. REBAR SHALL PROJECT A MINIMUM OF ½ RISER DIAMETER BEYOND OUTSIDE OF RISER.

CONCRETE BASE SHALL BE POURED IN SUCH A MANNER SO AS TO INSURE THAT CONCRETE FILLS BOTTOM OF RISER TO INVERT OF THE OUTLET PIPE TO PREVENT RISER FROM BREAKING AWAY FROM THE BASE. MINIMUM BASE WIDTH EQUALS 2 TIMES RISER DIAMETER.

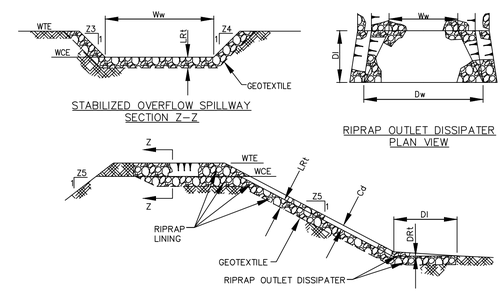
EMBEDDED SECTION OF ALUMINUM OR ALUMINIZED PIPE SHALL BE PAINTED WITH ZINC CHROMATE OR EQUIVALENT.

CLOGGED OR DAMAGED SPILLWAYS SHALL BE REPAIRED IMMEDIATELY. TRASH AND OTHER DEBRIS SHALL BE REMOVED FROM THE BASIN AND RISER.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
WP-2 WET POND PERMANENT RISER
Williams



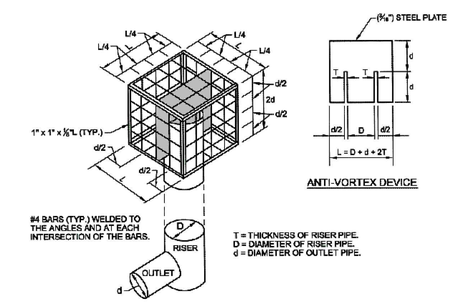
BASIN NO.	WEIR Z3 (FT)	Z4 (FT)	TOP ELEV WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	LINING RIPRAP SIZE (R-)	RIPRAP THICK. LRt (IN)	CHANNEL Z5 (FT)	DEPTH Cd (FT)	DISSIPATOR LENGTH Dl (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R-)	RIPRAP THICK DRt (IN)
1	3	3	1293	1291	4	3	9	3	1	6	22	4	18

DIMENSION PI SHALL BE 5' MINIMUM.

DISPLACED RIPRAP WITHIN THE SPILLWAY AND/OR OUTLET CHANNEL SHALL BE REPLACED IMMEDIATELY.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
FE-1 STABILIZED OVERFLOW SPILLWAY
Williams



RISER DIAMETER (IN)	OUTLET PIPE DIAMETER (IN) (D)	RISER PIPE THICKNESS (IN) (T)	RISER PIPE THICKNESS (IN) (L)
20	15	0.079	36

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TR TRASH RACK AND ANTI-VORTEX DEVICE
Williams

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN TO AVOID / MINIMIZED WETLAND IMPACTS AND PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

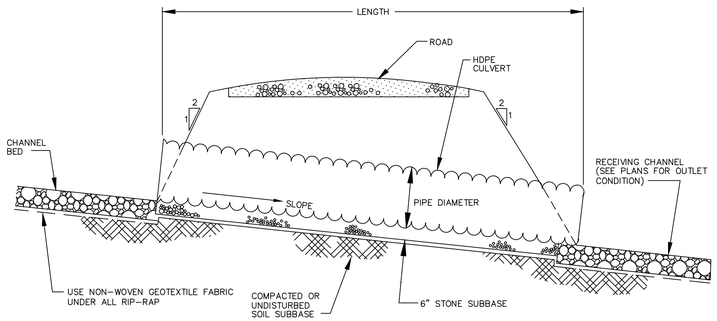
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS SHEET 1

FAIRMOUNT TOWNSHIP, LUZERNE COUNTY, PENNSYLVANIA

Williams

DRAWN BY: SWH	DATE: 7/29/19	ISSUED FOR BID:	SCALE:
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 5 OF 7
WO: 1211227	RID:		

WHM consulting, INC. designs, permits, resolutions
BA GROUP



NOTES:
1. BARRELS SHALL BE PLACED AT THE MINIMUM SLOPE INDICATED FOR THE CHANNEL.
2. AN ADDITIONAL 0.5 OF FREEBOARD SHALL BE PROVIDED IN THE CHANNEL ON THE INVERT SIDE OF THE CULVERT.
3. IF MULTIPLE BARRELS ARE USED, THEY SHALL BE PLACED SUCH THAT THERE IS A MINIMUM OF 1 BARREL WIDTH BETWEEN.
4. CORRUGATED METAL OR HDPE MAY BE USED UPON EVALUATION BY AN ENGINEER.

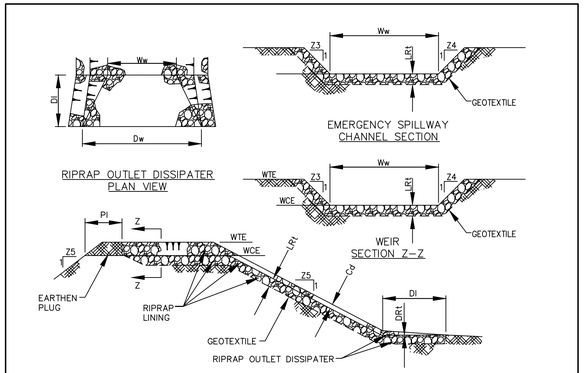
Compressor Station 607 Culvert Schedule

I.D.	Drainage Area [ac]	Req'd Flow [cfs]	Length (ft)	Inlet Invert (ft)	Outlet Invert (ft)	Slope [ft/ft]	No. of Pipes	Pipe Diameter [in]
CULVERT #1	1.75	10.05	63.0	1292.0	1288.5	0.056	1	24

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
RC TYPICAL ACCESS ROAD CULVERT

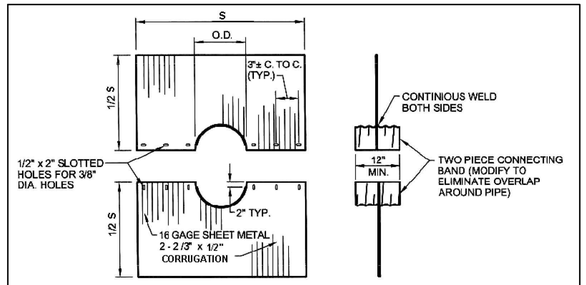


EMBANKMENT SECTION ALONG EMERGENCY SPILLWAY

BASIN NO.	WEIR					LINING		CHANNEL		DISSIPATOR			
	Z3 (FT)	Z4 (FT)	TOP ELEV WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. LRt (IN)	Z5 (FT)	DEPTH Cd (FT)	LENGTH Dl (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. DRt (IN)
1	3	3	1295.0	1293.0	10	3	6	2	1	15	6	3	12

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WP-1 WET POND EMERGENCY SPILLWAY WITH RIPRAP LINING



NOTES:

COLLAR SHALL BE OF SAME GAGE AND WITH SAME COATING AS PIPE WITH WHICH IT IS USED. INSTALL WITH CORRUGATIONS VERTICAL.

MINIMUM DISTANCE TO PIPE JOINT SHALL BE 2 FEET.

ALL COLLARS SHALL BE INSTALLED SO AS TO BE WATERTIGHT. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.

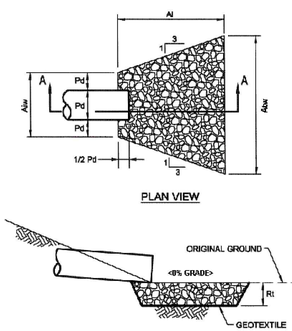
COLLAR SIZE AND SPACING SHALL BE AS INDICATED BELOW:

BASIN OR TRAP NO.	PIPE SIZE (IN)	S (IN)	NO. OF COLLARS	RISER TO FIRST COLLAR (FT)	COLLAR SPACING (FT)
1	15	42	2	5	8

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
C METAL ANTI-SEEP COLLAR FOR BASINS OR TRAPS



PLAN VIEW

SECTION A - A

NO.	PIPE DIA Do (IN)	MAN "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
R-1	24	0.013	0.013	10.05	3.2	R-4	14	14	6	20
R-2	24	0.012	0.011	5.39	5.94	R-3	9	10	6	19
R-3	24	0.042	0.033	8.58	3.5	R-4	14	14	6	20
R-4	24	0.059	0.025	1.38	0.44	R-4	14	14	6	20
R-5	24	0.012	0.011	5.34	5.9	R-3	9	10	6	19
R-6	24	0.012	0.011	5.31	5.9	R-3	9	10	6	19

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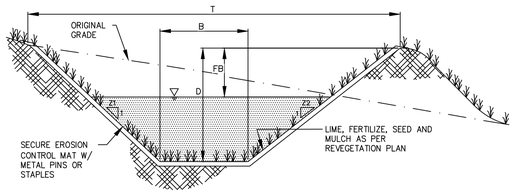
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
OP RIPRAP APRON OUTLET PROTECTION

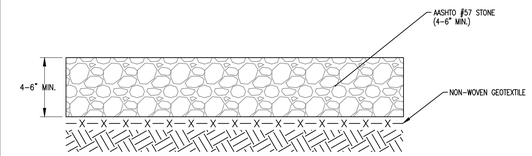


Channel ID.	LENGTH [FT]	SLOPE [%]	BASE WIDTH [FT]	DEPTH [FT]	SIDE SLOPES [Z1/Z2]	TOP WIDTH [FT]	LINING	OUTLET
CC #1	320	0.033	2	2.00	4/1	18.00	VEGETATED ECM (SC250)	R-3
CC #2	366	0.032	2	2.00	4/1	18.00	VEGETATED ECM (SC250)	CC-3
CC #3	558	0.020	2	6.00	2/1	26.00	R-3 RIPRAP	CULVERT #1
DC #1	548	0.025	2	2.00	4/1	18.00	VEGETATED ECM (SC250)	SOUTH OF PAD

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
CC TYPICAL COLLECTION / DIVERSION CHANNEL

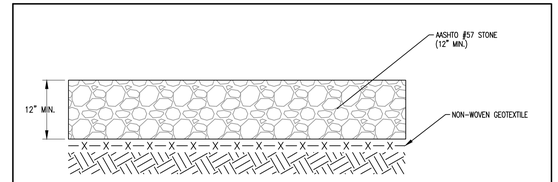


NOTES:
1. CROSS SECTION TO BE APPLIED TO DRY AREAS WITHOUT DRAINAGE CONCERNS.
2. EXISTING MATERIAL TO BE REMOVED AND STOCKPILED IN AN APPROVED LOCATION ONLY.
3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

PENNSYLVANIA

DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
CP COMPRESSOR PAD

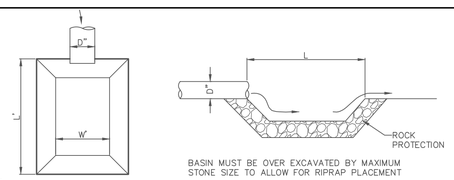


NOTES:
1. CROSS SECTION TO BE APPLIED TO DRY AREAS WITHOUT DRAINAGE CONCERNS.
2. EXISTING MATERIAL TO BE REMOVED AND STOCKPILED IN AN APPROVED LOCATION ONLY.
3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
AR PERMANENT/TEMPORARY STONE ACCESS ROAD



BASIN MUST BE OVER EXCAVATED BY MAXIMUM STONE SIZE TO ALLOW FOR RIPRAP PLACEMENT

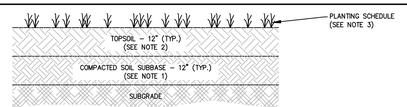
NOTES:
1. ALL OUTLET BASINS SHALL BE INSPECTED ON AT LEAST A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT.
2. DISPLACED RIPRAP WITHIN THE OUTLET BASIN SHALL BE REPLACED IMMEDIATELY.
3. SIDE SLOPES SHALL NOT EXCEED 1.5X:1V

ID	PIPE DIAMETER, D (IN)	FLOW, Q (CFS)	OUTLET BASIN WIDTH, W (FT)	OUTLET BASIN LENGTH, L (FT)	OUTLET BASIN DEPTH (FT)	RIPRAP ROCK SIZE	ROCK THICKNESS (IN)
WET POND OUTLET	15	0.05	3	18.00	1.00	R-3	9
INFILTRATION BASIN OUTLET	18	1.25	16.00	96.00	1.00	R-3	9

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
LS OUTLET BASIN DETAIL



WET POND LINER NOTES

1. COMPACTED SOIL SUBBASE SHALL HAVE A MINIMUM COEFFICIENT PERMEABILITY (k) OF 1x10-5 CM/S. SOIL TYPES PERMITTED FOR USE INCLUDE GM, SM, ML, GC, CL. SUBSOIL MATERIAL SHALL BE FREE FROM HARD CLODS, STIFF CLAY, HARDPAN, ASHES, SLAG, CONSTRUCTION, DEBRIS, PETROLEUM HYDROCARBONS, OR OTHER UNDESIRABLE MATERIAL. SUBSOIL MUST NOT BE DELIVERED OR PLACED IN A FROZEN OR MUDDY STATE. COMPACTED SOIL SUBBASE MATERIAL SHALL BE PLACED ON THE BOTTOM AND INTERIOR SIDES OF THE BASIN TO THE TOP OF BERM ELEVATION. COMPACTION EFFORT SHALL BE 95% MODIFIED PROCTOR (ASTM D1557).

2. TOPSOIL SHALL MEET THE FOLLOWING REQUIREMENTS:
   A. USE A MINIMUM OF 12 INCHES OF TOPSOIL IN THE EMERGENT VEGETATION ZONE (LESS THAN 18" DEEP) OF THE POND. IF NATURAL TOPSOIL FROM THE SITE IS TO BE USED IT MUST HAVE AT LEAST 8 PERCENT ORGANIC CARBON CONTENT (BY WEIGHT) IN THE A-HORIZON FOR SANDY SOILS AND 12% FOR OTHER SOIL TYPES.
   B. IF PLANTING SOIL IS BEING IMPORTED IT SHOULD BE MADE UP OF EQUIVALENT PROPORTIONS OF ORGANIC AND MINERAL MATERIALS.
   C. LIME SHOULD NOT BE ADDED TO PLANTING SOIL UNLESS ABSOLUTELY NECESSARY AS IT MAY ENCOURAGE THE PROPAGATION OF INVASIVE SPECIES.
   D. THE FINAL ELEVATIONS AND HYDROLOGY OF THE VEGETATIVE ZONES SHOULD BE EVALUATED PRIOR TO PLANTING TO DETERMINE IF GRADING OR PLANTING CHANGES ARE REQUIRED.

3. WET POND BOTTOM SHALL BE REVEGETATED WITH ERNST SEEDS ERNMX-128, SEASONALLY FLOODED WILDLIFE FOOD MIX, OR APPROVED EQUAL. SEE BELOW FOR MIX COMPOSITION AND SEEDING RATE.

ERNST SEEDS – SEASONALLY FLOODED WILDLIFE FOOD MIX – ERNMX-128

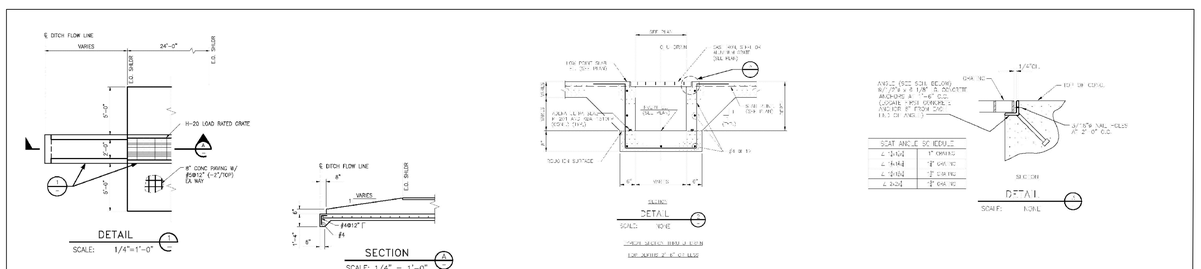
MIX COMPOSITION
21.5% PANICUM CLANDESTINUM, TIOGA (DEERTONGUE, TIOGA)
20.0% ELYMUS VIRGINICUS, PA ECOTYPE (VIRGINIA WILDRYE, PA ECOTYPE)
16.6% ANDROPOGON GERARDII, 'NIAGARA' (BIG BLUESTEM, NIAGARA')
15.0% ECHINOCHLOA CRUSGALLI VAR. FRUMENTACEA (JAPANESE MILLET)
10.0% CAREX VULPINOIDEA, PA ECOTYPE (FOX SEDGE, PA ECOTYPE)
8.0% PANICUM VIRGATUM, 'CAVE-IN-ROCK' (SWITCHGRASS, 'CAVE-IN-ROCK')
4.0% CHAMAECRISTA FASCICULATA, PA ECOTYPE (PARTRIDGE PEA, PA ECOTYPE)
1.5% VERBENA HASTATA, PA ECOTYPE (BLUE VERVAIN, PA ECOTYPE)
1.0% HELIOPSIS HELIANTHOIDES, PA ECOTYPE (OXEYE SUNFLOWER, PA ECOTYPE)
1.0% JUNCUS EFFUSUS (SOFT RUSH)
0.8% AGROSTIS PERENNANS, ALBANY PINE BUSH-NY ECOTYPE (AUTUMN BENTGRASS, ALBANY PINE BUSH-NY ECOTYPE)
0.1% ASCLEPIAS INCARNATA, PA ECOTYPE (SWAMP MILKWEED, PA ECOTYPE)
0.1% ASTER NOVAE-ANGLIAE, PA ECOTYPE (NEW ENGLAND ASTER, PA ECOTYPE)
0.1% EUPATORIUM FISTULOSUM, PA ECOTYPE (JOE PYE WEED, PA ECOTYPE)
0.1% EUPATORIUM PERFOLIATUM, PA ECOTYPE (BONESET, PA ECOTYPE)
0.1% MONARDA FISTULOSA, FORT INDIANTOWN GAP-PA ECOTYPE (WILD BERGAMOT, FORT INDIANTOWN GAP-PA ECOTYPE)
0.1% PYCNANTHEMUM TENUIFOLIUM (NARROWLEAF MOUNTAINMINT)

SEEDING RATE: 20 LB PER ACRE, OR 1/2 LB PER 1,000 SQ FT

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
WET POND LINING DETAIL



PENNSYLVANIA

DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
TD TRENCH DRAIN

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
041211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

WM consulting, INC. — designs, permits, resolutions — BA GROUP

REVISIONS

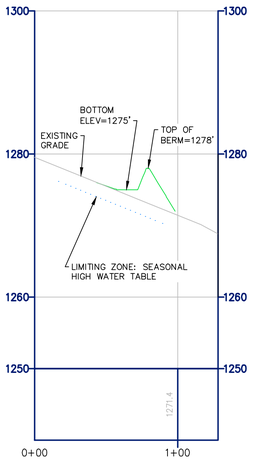
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN TO AVOID / MINIMIZED WETLAND IMPACTS AND PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

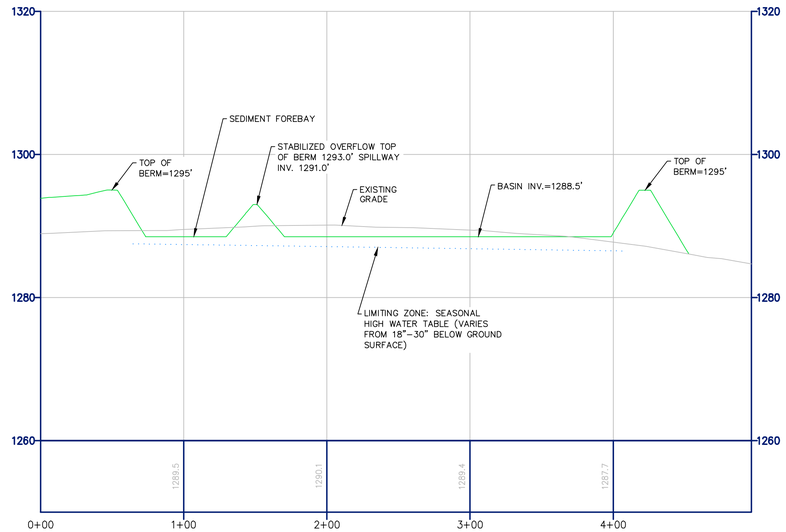
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS SHEET 2

FAIRMOUNT TOWNSHIP, LUZERNE COUNTY, PENNSYLVANIA

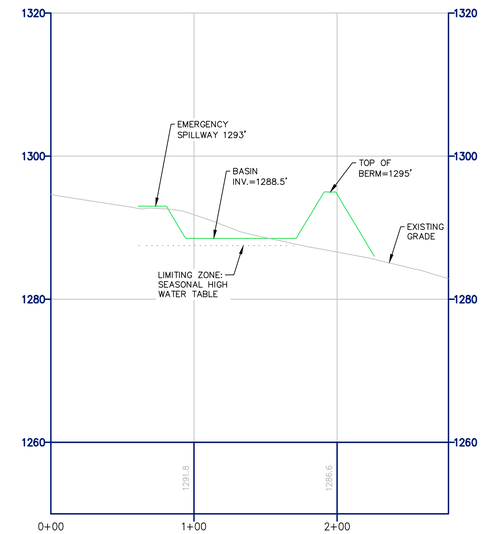
DRAWN BY: SWH	DATE: 7/29/19	ISSUED FOR BID:	SCALE:
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 6 OF 7
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	



CROSS SECTION A–A' (INFILTRATION BASIN)
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'



CROSS SECTION B–B' (SEDIMENT BASIN/WET BOTTOM POND)
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'



CROSS SECTION C–C' (SEDIMENT BASIN/WET BOTTOM POND)
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=20'

SCALE
50 25 0 50
SCALE 1" =50'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
PENNSYLVANIA

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN TO AVOID / MINIMIZED WETLAND IMPACTS AND PER PaDEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS SHEET 3

FAIRMOUNT TOWNSHIP LUZERNE COUNTY PENNSYLVANIA

DRAWN BY: SWH	DATE: 7/29/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION: 1
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 7 OF 7
WO: 1211227	RID:		

Transcontinental Gas Pipe Line Company, LLC

Section 3-3 PCSM Plan for Compressor Station 607

Leidy South Project – Compressor Station 607

September 2019
(Revised May 2020)

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- 4.1 Resolutions to Soil Limitations
- 4.2 Geologic Formations

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10.0 Recycling and Disposal of Materials (NOI Checklist Item 7.k)

11.0 Thermal Impacts (NOI Checklist Item 7.m)

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14.0 Offsite Discharge Analysis *(Added May 2020)*

15.0 Non-Structural and Structural Water Quality BMP Description *(Added May 2020)*

16.0 The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques

Attachments

1 Project Location Maps

2 Soils Map and Report

3 Site Evaluation and Soil Infiltration Test Report *(Revised May 2020)*

4 PCSM Plan BMP Design Worksheets and Calculations *(Revised May 2020)*

5 Non-Structural and Structural Water Quality BMPs Map *(Added May 2020)*

6 Offsite Discharge Report *(Added May 2020)*

Drawings (NOI Checklist Item 7.i) *(Revised May 2020)*

1 of 7 Post Construction Stormwater Management Plan Cover

2 of 7 Post Construction Stormwater Management Plan Existing Conditions

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1.0 Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Leidy South Project – Compressor Station 607. Compressor Station 607 will consist of installing two Solar Titan 130 gas driven turbine compressor units (23,465 nominal HP at International Organization for Standardization (ISO) conditions each, 46,930 HP total), gas coolers and associated ancillary facilities in Fairmount Township, Luzerne County, Pennsylvania.

Compressor Station 607 is proposed as part of the overall Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

This PCSM Plan has been developed for the Compressor Station 607 site. The PCSM Plan shall be designed and implemented to be consistent with the Post Construction Stormwater Management (PCSM) Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). All work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the Compressor Station 607 site will be approximately 18.2 acres. Subject to receipt of permits and authorizations, Transco anticipates construction of the Project would commence in January 2021 to meet a target in-service date of December 1, 2021.

2.0 Topographic Features of the Area (NOI Checklist Item 7.a)

Project Location Map for Compressor Station 607 is included in Attachment 1. The map shows the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Sweet Valley, Pennsylvania quadrangles.

3.0 Receiving Surface Waters (NOI Checklist Item 7.e)

The following table (Table 1) lists each watershed located in Compressor Station 607 Project Area, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat

Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCGP-3 permit application.

Table 1 Receiving Waters			
Watershed Name	**Designated Use**	**Existing Use**	**PFBC Classification**
Lick Branch	HQ-CWF, MF	-	Class A Wild Trout
Phillips Creek	HQ-CWF, MF	-	Class A Wild Trout
MF: Migratory Fishes, HQ-CWF: High Quality- Cold Water fishes			

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 7.b, 7.l, 8.a, 8.e)

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 6 soil mapping units located within the LOD, see Table 2 below:

Table 2 – Soils Mapping Units within LOD	
Soil Mapping Unit	**Soil Series**
LaB	Lackawanna channery silt loam, 3 to 8 percent slopes
LaC	Lackawanna channery silt loam, 8 to 15 percent slopes
LcB	Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony
LcD	Lackawanna channery silt loam, 8 to 25 percent slopes, extremely stony
MoB	Morris channery silt loam, 0 to 8 percent slopes
WlB	Wellsboro channery silt loam, 3 to 8 percent slopes

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the Compressor Station 607 and resolutions were identified in Section 4.1.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Lackawanna	LaC, LaD, LcB, LcD	X	C	X			X	X	X			X	X				X
Morris	MoB	X	C/S	X	X		X	X	X	X		X	X				X
Wellsboro	WIB	X	C/S	X	X		X	X	X	X	X		X				X

4.1 Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.
3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with all local, state, and federal regulations.
4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.
5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.

6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.

7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.

8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc to minimize soil erosion.

4.2 Geologic Formations

Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis completed for the Project revealed that the Compressor Station 607 does not cross any known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Compressor Station 607 lies within a zone of moderate to low landslide incidence and susceptibility.

Due to the moderate to low landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed and is submitted with this application (Attachment B). This report provides information about any potential geological hazards occurring in the vicinity of the Compressor Station 607 Project area. The Geological Hazard Assessment and Mitigation Plan also identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 7.c)

The Compressor Station 607 will involve the installation of two gas driven turbine compressor units, gas coolers, associated facilities, parking area and access roads. Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (https://www.mrlc.gov/viewer/), it appears that land use for the past 20 years has been cultivated cropland. Based on the surrounding land characteristics, land use within the past 50 years would

likely have been cropland, forested land or meadow. The contractor will construct stormwater BMPs to mitigate the increase in volume and peak rates associated with construction. The proposed BMPs are designed to store the net increase in volume between the pre- and post-development 2 year rain events. Refer to the Stormwater BMP Sizing Calculations in Attachment 4 for additional information.

6.0 Post Construction Stormwater Management Best Management Practices, Installation Sequence and PCSM Critical Stages (NOI Checklist Item 7.f, 7.g)

Increase in stormwater runoff during and after construction shall be controlled by sequencing the operations and using a selection of Best Management Practices (BMPs). Conveyance BMPs, a wet detention pond and an infiltration basin will be installed across the developed area to convey the net increase in volume between the pre and post development 2-year storm events and mitigate the increase (pre-post development) in peak runoff for the 2-, 10-, 50-, and 100-year storm events. Sediment basin used at the Site for E&S control will be dewatered and subsequently regraded as a wet detention pond. Collection channels will be constructed to direct a majority of the runoff from the developed area to the wet pond and infiltration basin All BMP design calculations and drawings are provided in Attachment 4 and PCSM Plan set.

BMP Installation Sequence (NOI Checklist Item 7.g)

The PCSM BMPs should be installed in a manner designed to:

1. Protect BMP areas associated with infiltration from compaction prior to and during installation.
2. Maintain proper Erosion and Sediment Control Measures during construction.
3. Wet Detention Pond with Forebay
    a. Dewater the sediment basin and flush out the outlet pipe and outlet basin to clean excess accumulated sediment.
    b. Remove any temporary risers from the basin and install permanent risers
    c. Make any necessary repairs to the basin bottom and inside slopes. This includes repairs to the 12” compacted soil subbase and/or 12” topsoil cover.
    d. Remove existing vegetation from the basin bottom. Apply erosion control measures as necessary.

e. As areas are completed, seed, plant and mulch in accordance with the section below.

f. Install anti-grazing measures, if necessary

g. Wet pond bottom shall be revegetated with ERNST seeds ERNMX-128, seasonally flooded wildlife food mix, or approved equal. Where necessary, reseed and mulch interior side slopes with same seed mix utilized for revegetating the sedimentation basin.

4. Infiltration Basin

   a. Protect infiltration basin area from compaction prior to installation.

   b. Excavate basin bottom to an uncompacted subgrade free from rocks and debris. Do NOT compact subgrade.

   c. Install outlet control structures.

   d. Construct and compact berms surrounding the basin such that the side slopes are no steeper than 3:1.

5. Select plants that are well adapted to the specific site conditions. Meadow plants must be able to out compete weed species in the first few years as they become established.

6. All temporary E&S BMPs will be removed following site stabilization. Other Erosion and Sediment Control measures are not to be removed until the site is fully stabilized.

7. All installed BMPs will be monitored until final site stabilization is achieved.

8. Long term operation and maintenance guidelines discussed below shall be followed.

PCSM Critical Stages

Critical points requiring visits by the licensed professional or delegate are as follows:

1. Following final grading and seeding of the collection channels, wet pond and infiltration basin in order to confirm they have been constructed according to the plan details for proper collection, infiltration, and conveyance of runoff. Periodic assessments will need to be made to ensure that accumulated sediment should be cleaned out so the basin maintains necessary design volume.
2. During the layout and excavation of the outlet structures, the professional or delegate will

ensure sizing, materials specifications, and construction procedures are followed to enable proper storage and discharge to the pond/basin.

3. For final inspection of constructed BMPs.
4. At the establishment of hard surface stabilization or 70% vegetation covers to allow removal of E&S controls.

7.0 Net Change in Volume and Rate of Runoff (NOI Checklist Item 7.d, 8.b, 8.c, 8.d)

An analysis of pre- and post-development stormwater runoff was performed for the proposed Compressor Station 607. The installation of compressor units and construction of parking area and access road will increase the volume of stormwater runoff between the pre and post development 2 year rain event due to the increase in the type and size of the impervious area. The increase in impervious area will increase the pre to post development peak runoff for the 1, 2, 10, 25, 50, and 100 year storm events. Design calculations using HydroCAD software are included in Attachment 4. Refer to the Post-Construction Stormwater Management (PCSM) Plan drawings for additional information.

Pre- and Post-Construction Stormwater Volume for 2-yr Rainfall event

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction after BMPs (cf)	Net (cf)
52,920	66,782	34,499	-18,421

Pre-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
6.92	11.16	24.72	35.59	45.88	58.41

Post-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
10.90	16.24	32.56	45.18	56.91	70.90

Post-Construction w/ BMPs Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
5.11	8.22	19.28	28.53	37.30	49.54

Difference between Pre-Construction and Post-Construction w/ BMPs

	1-year	2-year	10-year	25-year	50-year	100-year
NET Difference	-1.81	-2.94	-5.44	-7.06	-8.58	-8.87

8.0 Temporary and Permanent Stabilization

Appropriate seed mixtures for temporary and permanent stabilization are outlined on the notes sheet of the plan drawings.

8.1 Permanent Stabilization

Upon final completion of an earth disturbance activity or any stage or phase of an activity, the site shall immediately have topsoil restored, replaced, or amended, seeded, mulched or otherwise permanently stabilized and protected from accelerated erosion and sedimentation. E&S BMPs shall be implemented and maintained until the permanent stabilization is completed. Once permanent stabilization has been established, the temporary E&S BMPs shall be removed. Any areas disturbed in the act of removing temporary E&S BMPs shall be permanently stabilized upon completion of the temporary E&S BMP removal activity. For an earth disturbance activity or any stage or phase of an activity to be considered permanently stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which permanently minimizes accelerated erosion and sedimentation.
- When erosion and sedimentation controls are to be removed in agricultural non-sensitive areas (streams/wetlands), agricultural landowners shall maintain agricultural BMPs per PaDEP regulations.

8.2 Temporary Stabilization

Upon temporary cessation of an earth disturbance activity or any stage or phase of an activity where a cessation of earth disturbance activities will exceed 4 days (including agricultural areas), the site shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage or phase of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which temporarily minimizes accelerated erosion and sedimentation.

8.3 Stabilization During Non-Growing Season

When utility construction must be done and is completed during a non-growing season, interim stabilization BMPs must be implemented and adequately maintained. The application of straw mulch at the rate of 3.0 tons per acre is required. The BMPs should be inspected weekly (unless snow covered) and after each runoff event to identify areas that become bare. All temporary erosion and sediment pollution controls must be maintained.

8.4 Wetland Stabilization

Temporary cover for wetlands areas will include Annual Ryegrass at 40lbs/acre. Do not lime, fertilize or mulch wetland areas. Permanent wetland mix is ERNST 122 FACW Meadow Mix at 20 lb/acre.

8.5 Riparian Buffer Stabilization

Temporary Cover for riparian areas to include see from mixture 1 from Table 11.4 (provided in the PCSM Plan set), at the outlined seeding rate. Permanent cover for riparian areas will include 20 lbs/acre of Ernst 178 Riparian buffer mix. Where Slopes exceed 10%, the seed mixture 2 from Table 11.4 shall be utilized.

9.0 Long Term Operation and Maintenance Schedule (NOI Checklist Item 7.j)

All BMPs should be properly maintained to ensure their effectiveness. Sheet flow conditions and infiltration must be sustained throughout the life of the BMP. BMPs should be inspected for clogging from sediment of debris, damage by foot or vehicular traffic, and flow channelization. Inspections should be made on a quarterly basis for the first two years following installation, and then twice per year thereafter. Inspections should also be made after every storm event greater than 1 inch during the establishment period.

Channel linings should be inspected for signs of erosion or dislodging, as applicable. Channels should be inspected for debris, overgrown vegetation, and other blockages. Catch Basins and Inlets should be inspected and cleaned at least two times per year and after runoff events. Vegetation along the surface of the infiltration basin should be maintained in good conditions. Vehicles should not be parked or driven on an infiltration basin and care should be taken to avoid excessive compaction by mowers. Inspect the basin after runoff events and make sure that runoff drains within 72 hours. Wet pond should be inspected at least 4 times per year and after major storms (> 2 inches per 24 hours) or rapid ice breakup. The pond drain should be inspected and tested 4 times per year.

Operation and maintenance guidelines should be provided to all facility owners and tenants. Sediment and debris should be routinely removed upon observation. If erosion is observed, measures should be taken to improve the dispersion method to address the source of erosion. Sediment should be removed when the BMP is thoroughly dry. Trash and debris removed from the site should be deposited only at suitable disposal/recycling sites and must comply with applicable local, state, and federal waste regulations. Grass cover should be mowed with low ground pressure equipment as needed to control noxious weeds. Mowing should be done only when the soil is dry in order to prevent tracking damage to vegetation, soil compaction, and flow concentrations. If vegetative cover is not fully established within the designated time, it should be replaced with an alternative species. Unwanted or invasive growth should be removed on an annual basis.

During the first growing season or until established, wet pond vegetation should be inspected every 2 to 3 weeks. Wet ponds should be inspected at least 4 times per year and after major storms (greater than 2 inches in 24 hours) or rapid ice breakup. Inspections should access the vegetation, erosion, flow channelization, bank stability, inlet/outlet conditions, embankment and sediment/debris accumulation. Pond drains should be inspected 4 times per year.

Vegetated areas will be inspected weekly and after runoff events until permanent vegetation is achieved. Once the vegetation is established, inspections of health, diversity, and density should be performed at least twice per year, during both the growing and non-growing season. Vegetative cover should be sustained at 85% and reestablished if damage greater than 50% is observed. Damaged BMPs will be repaired as soon as possible upon discovery. Repairs will be made to restore damaged BMPs to their original design condition.

10.0 Recycling and Disposal of Materials (NOI Checklist Item 7.k)

The restoration will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is

not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here):

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Material Safety Data Sheets (MSDSs).

11.0 Thermal Impacts (NOI Checklist Item 7.m)

Due to the overall nature of the Project, thermal impacts to surface waters are not anticipated. The primary means to address thermal impacts on this Project is to limit the size and duration of exposed earth.

Stormwater runoff associated with the installation of the compressor units will be routed through the stormwater BMP's designed to retain and infiltrate the first surge of water from the site. The first surge of water will be the warmest water for the duration of the storm event and will quickly cool as the storm event progresses. The BMPs are designed to capture and infiltrate this warmest surge of stormwater. Based on routing calculations, stormwater is not discharged from the BMPs for the first 12 hours during a 100-year/24-hour storm event. The retention period is longer for less intense storms. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

12.0 Antidegradation Requirements (NOI Checklist Item 7.o, 8.f)

A hydraulic analysis was conducted to determine the location of Compressor Station 607 along Transco's existing pipeline system. The defined hydraulic range for Compressor Station 607 is primarily located within exceptional value (EV) or high-quality (HQ) watersheds. Transco used various criteria to evaluate parcels suitable for a compressor station within the hydraulic range required to meet the purpose and need of the project. The criteria for parcel evaluation included but was not limited to existing conditions, resource impacts, workspace, and reasonable availability. Based on the location selected for Compressor Station 607, impacts to EV and HQ watersheds are unavoidable. Transco determined that there are no cost-effective and environmental sound viable non-discharge alternatives for the project.

Earth disturbance will be minimized to the extent practical and will be phased or sequenced to only disturbed portions that are necessary for the specific scope of work. Where possible, the LOD was decreased to avoid additional disturbance to the extent practical.

Anti-Degradation Best Available Combination of Technologies (ABACT) standards have been proposed for Compressor Station 607 because there are no viable non-discharge alternatives. The Erosion and Sediment Control Plan prepared for the Project outlines a more stringent design and E&S BMPs that meet ABACT standards.

The Compressor Station 607 is located in HQ watersheds and construction activities in these areas will result in increased discharge of stormwater to surface waters which will be mitigated by the implementation of post construction stormwater management (PCSM) BMP's. Proposed PCSM BMPs are designed with stormwater volume reduction and water quality treatment maximized to the extent practicable within the site constraints to maintain and protect existing water quality and existing and designated uses.

13.0 Riparian Buffers (NOI Checklist Item 7.n)

Temporary workspace associated with Compressor Station 607 is located within the non-forested riparian buffer of stream S1-T2-607A. After completing the construction activities, the impacted riparian area will be reseeded with a riparian seed mix.

Because the project is temporary in nature and the site will be fully restored to its preexisting condition leaving riparian buffers undisturbed to the extent practical, it is eligible for the Riparian Buffer Waiver under 25 PA Code §102.14(d)(2)(iv). As such, a Riparian Buffer Waiver has been requested along with this ESCGP-3 application (Section 1-7).

14.0 Offsite Discharge Analysis

The stormwater BMP's being constructed at Compressor Station 607 are in areas that will discharge stormwater to offsite non-surface water. These areas have been analyzed to ensure that these discharges will be non-erosive to adjacent property owners. The analysis has been performed in accordance with PADEP Document 3150-FS-DEP4124, "Off-Site Discharges of Stormwaters to Areas That Are Not Surface Waters". The analysis is presented in Attachment 6- Offsite Discharge Report. Criteria used to determine that offsite erosion at each discharge point will not occur are presented below:

Wet Detention Pond #1 with Forebay

This wet pond is in the northeast corner of the site. The outfall discharges to a sediment trap outlet basin at the northeast corner of the wet pond. Calculations provided for the project site runoff show that there is no net increase in rate of runoff during any storm event at the outfall. The area downstream of the outfall is over 90% vegetated. Additionally, the velocity coming out of the outfall protection for the 25-year 24-hour storm event was calculated and found to be 0.86 fps. Since the outlet velocity is below 2.5 fps downstream erosion will be minimal if not negligible.

Infiltration Basin

This infiltration basin is in the northern part of the site between Maransky Road and the pipeline right-of-way. The outfall discharges to a sediment trap outlet basin at the northeast corner of the wet pond. Calculations provided for the project site runoff show that there is no net increase in rate of runoff during any storm event at the outfall. The area downstream of the outfall is over 90% vegetated. Additionally, the velocity coming out of the outfall protection was calculated and found to be 2.47 fps. Since the outlet velocity is below 2.5 fps downstream erosion will be minimal if not negligible.

15.0 Non-Structural and Structural Water Quality BMP Description

Limit of disturbance will be minimized to the maximum extent possible by disturbing only those areas necessary to complete the proposed earthwork and BMP installations.

Sensitive features such as wetlands and riparian buffers will be protected to the maximum extent possible. These areas will be clearly delineated in the field and protected prior to any construction activities taking place. Existing vegetation is not to be removed from the protected area and the areas shall not be subject to grading or movement of existing soils. Any protected

areas that have been disturbed/compacted during construction will be restored using soil amendment and restoration.

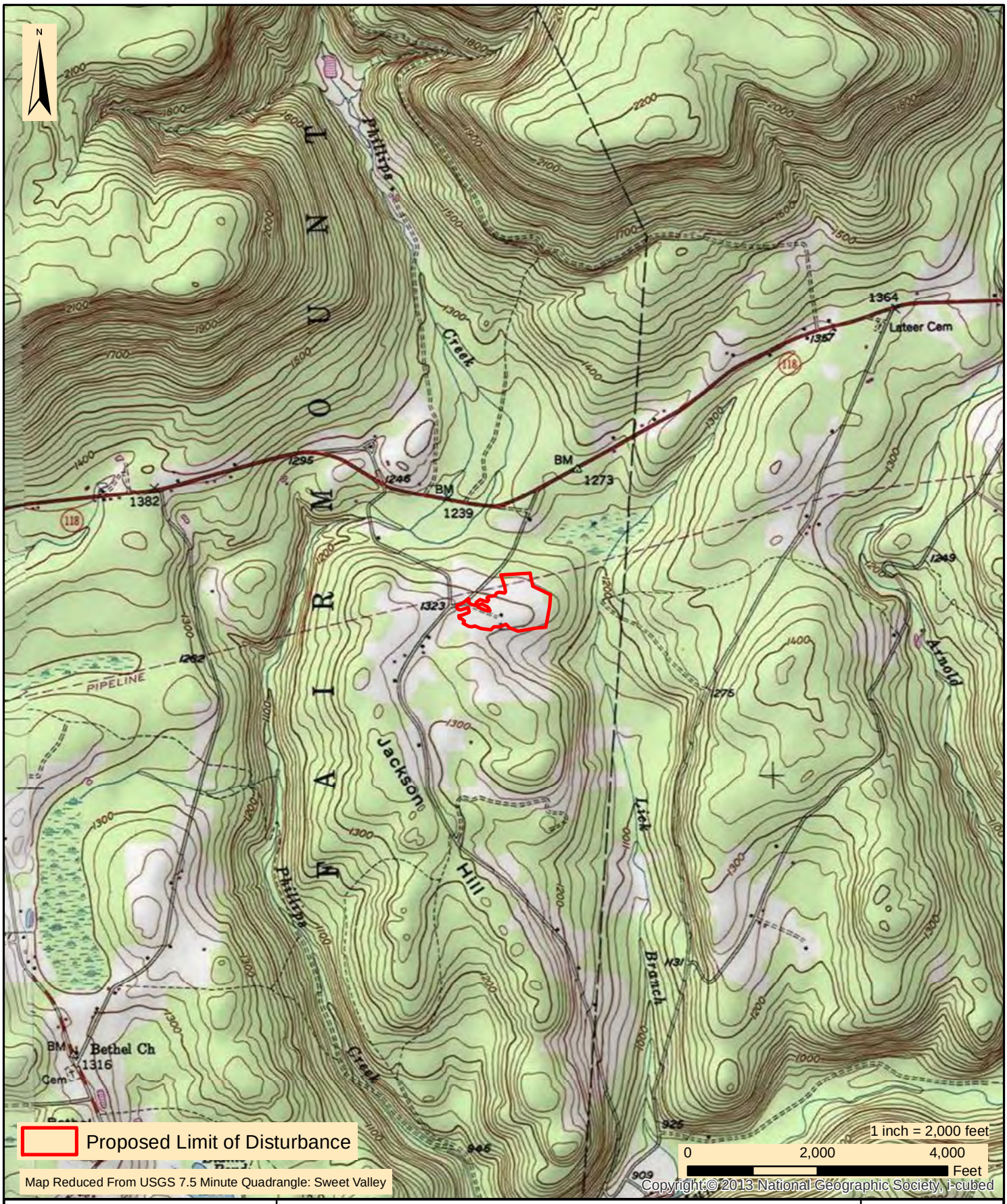
Temporarily impacted riparian buffer will be fully restored to its preexisting conditions. Disturbed areas that are not proposed to be impervious will be revegetated as per the seeding and mulching notes provided in PCSM plan notes.

Wet detention pond will act as a water quality BMP. Relatively steeper slopes are utilized for the wet pond embankments to minimize disturbed area. Wherever possible, existing natural drainage patterns will be utilized to divert flow to the proposed infiltration basin. Street sweeping will be done near the site entrance on Maransky road.

16.0 The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques

These plans and narrative were prepared by Kevin Clark, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Stormwater BMP Manual, December 2006. Plan preparer's resume is provided in Attachment C of the ESCGP-3 permit package).

ATTACHMENT 1
PROJECT LOCATION MAP



WHM consulting, INC.
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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

NEW **PROPOSED** COMPRESSOR STATION 607
PROJECT LOCATION MAP

FAIRMOUNT TOWNSHIP LUZERNE COUNTY PENNSYLVANIA

Date:	8/21/2019
WHM Drawing Number:	WILLIAMS204A001
Drawn By:	FTN
Figure Number:	5

ATTACHMENT 2
SOILS MAP AND REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Luzerne County, Pennsylvania

May 31, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,250 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Luzerne County, Pennsylvania
Survey Area Data: Version 13, Sep 19, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 29, 2010—Nov 22, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
LaB	Lackawanna channery silt loam, 3 to 8 percent slopes	13.9	57.0%
LaC	Lackawanna channery silt loam, 8 to 15 percent slopes	1.5	6.1%
MoB	Morris channery silt loam, 0 to 8 percent slopes	1.8	7.4%
MsB	Morris channery silt loam, 0 to 8 percent slopes, extremely stony	0.7	2.9%
OpD	Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes	0.0	0.1%
WlB	Wellsboro channery silt loam, 3 to 8 percent slopes	6.5	26.5%
Totals for Area of Interest		**24.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor

components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Luzerne County, Pennsylvania

LaB—Lackawanna channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w092
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lackawanna and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 7 inches: channery silt loam
Bw1 - 7 to 17 inches: channery silt loam
Bw2 - 17 to 26 inches: channery loam
Bx - 26 to 60 inches: channery loam
C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 17 to 36 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 16 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 8 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Oquaga

Percent of map unit: 4 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Upper third of mountainflank, crest, nose slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Morris

Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

LaC—Lackawanna channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w095
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lackawanna and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 7 inches: channery silt loam
Bw1 - 7 to 17 inches: channery silt loam
Bw2 - 17 to 26 inches: channery loam
Bx - 26 to 60 inches: channery loam
C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 17 to 36 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 16 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 10 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Oquaga

Percent of map unit: 3 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Upper third of mountainflank, crest, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Morris

Percent of map unit: 2 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

MoB—Morris channery silt loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2vclq
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Morris and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Morris

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 12 inches: channery silt loam
Eg - 12 to 16 inches: channery silt loam
Bx - 16 to 60 inches: channery silt loam
C - 60 to 72 inches: channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 10 to 22 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Norwich

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

MsB—Morris channery silt loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2vxct
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Morris, extremely stony, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Morris, Extremely Stony

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: channery silt loam

Bw - 5 to 12 inches: channery silt loam
Eg - 12 to 16 inches: channery silt loam
Bx - 16 to 60 inches: channery silt loam
C - 60 to 72 inches: channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 7.0 percent
Depth to restrictive feature: 10 to 22 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Norwich, extremely stony

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Wellsboro, extremely stony

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Convex, concave
Across-slope shape: Convex, linear
Hydric soil rating: No

OpD—Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9yhm
Elevation: 700 to 1,800 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Oquaga and similar soils: 55 percent
Lordstown and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oquaga

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Reddish ablation till derived from sandstone and siltstone

Typical profile

A - 0 to 7 inches: channery silt loam
Bw - 7 to 30 inches: very channery silt loam
R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 15.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Lordstown

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear

Typical profile

A - 0 to 7 inches: channery silt loam
Bw - 7 to 26 inches: channery silt loam
C - 26 to 30 inches: very channery loam
2R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

WlB—Wellsboro channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2vck5
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Wellsboro and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wellsboro

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 22 inches: channery silt loam
Bx - 22 to 55 inches: channery loam
C - 55 to 72 inches: very channery loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 14 to 30 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Lackawanna

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Morris

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Oquaga

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Upper third of mountainflank, crest, nose slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

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ATTACHMENT 3
SITE EVALUATION AND SOIL INFILTRATION TEST REPORT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC.
A SUBSIDIARY OF THE WILLIAMS COMPANIES, INC.
POTENTIAL COMPRESSOR STATION 607A PROJECT

SITE EVALUATION AND SOIL INFILTRATION TEST REPORT

1.0 Site Soils

Based upon mapping provided by the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS) Web Soil Survey[1], the project areas under consideration for infiltration BMPs are underlain by the following soil series: Lackawanna channery silt loam, 3 to 8 percent slopes (LaB).

Lackawanna channery silt loam, 3 to 8 percent slopes (LaB) soils consist of gently sloping, well drained soils, found on mountain shoulders and summits. The parent material is loamy till derived mainly from reddish sandstone, siltstone, and shale. Bedrock is typically found at approximately 72 inches. A fragipan is typically located at a depth ranging from 17 to 36 inches. Depth to the water table ranges from 16 to 36 inches. The available water capacity of LaB soils is low. Permeability is slow.

The soil infiltration testing described in this section focused on LaB soils. These soils are anticipated as being the primary soils in the areas of possible BMPs.

2.0 Field Investigation and Testing Methodology

BAI completed a total of nine test pits and nine double-ring infiltrometer tests; locations were selected to be representative of the main soil series in the areas of potential infiltration BMPs. Figure 1 presents field-located stations of test pits and corresponding double-ring infiltrometer tests.

Four soil test pits (TP-1 through TP-4) were dug by hang on June 5, 2019, and five test pits (TP-5 through TP-9) were dug by hand on June 6, 2019, to depths of approximately 24 inches to evaluate infiltration rates of shallow soils in the study area. Four double-ring infiltrometer (DRI) tests were conducted on June 5, 2019 and five DRI tests were conducted on June 6, 1019 within each of the test pits completed by BAI. The double-ring infiltration tests consisted of an 11-inch diameter outer ring (OR) and a 4-inch diameter inner ring (IR) set 4-5 inches deep into the bottom of each test pit (approximately 28 inches below grade) to determine infiltration rates of shallow soils at various locations across the site. DRI testing was initiated by completing a one-hour pre-soak, which involved adding six (6) inches of head to both the OR and IR. By noting the drop in head in each infiltrometer at 30 minute increments during the pre-soak, BAI determined that 30-minute testing intervals for TP-2 through TP-9, and 10-minute testing intervals for TP-1, would be used for DRI testing as per the Pennsylvania stormwater Best Management Practices Manual (Document ID 363-0300-002) Appendix C.

Following the pre-soak, all the test pits were refilled to a six (6) inch head level in both the IR and OR. Drop in head was measured from a fixed reference point in the IR every 10 minutes for TP-1, and 30 minutes TP-2 through TP-9. The IR and OR were refilled following each reading. Results for DRI tests are discussed in Section 3.0.

Three test pits (TP-5A through 7A) were completed in May 1, 2020 to characterize soils and identify limiting zones. The three test pits were made using an excavator, digging to a depth

[1] http://websoilsurvey.nrcs.usda.gov/app/

ranging from 4 to 6 feet. The locations of the 2020 test pits are seen in Figure 1 and results are discussed in Section 3.0.

3.0 Findings and Conclusions

Based upon examination of each test pit, soils beneath the Site consist of brown (7.5YR 4/2) channery silt loam to a depth of at least 6 inches. From 6 to 20 inches a brown (7.5YR 4/3) channery loam was observed. The soil from 20 to 24 inches consisted of a very firm brown (7.5YR 4/3) channery loam, fragipan. The depth to the fragipan varied from 19 to 24 inches at the Site. Testing was completed within the same soil series at nine locations spread out in the areas of the potential BMP locations.

For the limiting zone investigation, each of test pit excavated had a limiting zone at the seasonal high water table (SHWT). Soil mottling, evidence of SHWT, was observed at every test pit. The SHWT was shallowest in test TP-7A at around 18 in below grade surface and the deepest in test pit 6 at 30" below grade surface (bgs). The water table was also encountered in all 3 test pits. TP- 5A and TP-6A had saw the water table at 48 in bgs, and TP-7A saw the water table at 30 in bgs. Bedrock was not encountered in the test pits.

The following tables summarize the DRI readings for each test pit and the limiting zones identified in each test pit.

		Infiltration Testing Results								
Hole	Reading Interval	Reading 1 (in.)	Reading 2 (in.)	Reading 3 (in.)	Reading 4 (in.)	Reading 5 (in.)	Reading 6 (in.)	Reading 7 (in.)	Reading 8 (in.)	Infiltration Rate (in./hr)
TP1	10 min	0.80	0.80	0.50	0.25	0.25	0.25	0.25	0.25	1.50
TP2	30 min	0.125	0.125	0.125	0.125					0.25
TP3	30 min	0.125	0.0625	0.0625	0.0625					0.16
TP4	30 min	0.125	0.125	0.125	0.125					0.25
TP5	30 min	0.25	0.25	0.25	0.25					0.50
TP6	30 min	0.125	0.125	0.125	0.125					0.25
TP7	30 min	0.813	0.813	0.813	0.813					1.63
TP8	30 min	0.063	0.063	0.063	0.063					0.13
TP9	30 min	0.5	0.5	0.5	0.438					0.97

TP-1

The infiltration rate within TP-1 was 1.50 inches per hour (iph) based upon an average rate of drop of 0.25 inches over the last four 10-minute infiltration readings.

TP-2

The infiltration rate within TP-2 was 0.25 inches per hour (iph) based upon an average rate of drop of 0.125 inches over the four 30-minute infiltration readings.

TP-3

The infiltration rate within TP-3 was 0.16 inches per hour (iph) based upon an average rate of drop of 0.078 inches over the four 30-minute infiltration readings.

TP-4

The infiltration rate within TP-4 was 0.25 inches per hour (iph) based upon an average rate of drop of 0.125 inches over the four 30-minute infiltration readings.

TP-5

The infiltration rate within TP-5 was 0.50 inches per hour (iph) based upon an average rate of drop of 0.25 inches over the four 30-minute infiltration readings.

TP-6

The infiltration rate within TP-6 was 0.25 inches per hour (iph) based upon an average rate of drop of 0.125 inches over the four 30-minute infiltration readings.

TP-7

The infiltration rate within TP-7 was 1.63 inches per hour (iph) based upon an average rate of drop of 0.813 inches over the four 30-minute infiltration readings.

TP-8

The infiltration rate within TP-8 was 0.13 inches per hour (iph) based upon an average rate of drop of 0.063 inches over the four 30-minute infiltration readings.

TP-9

The infiltration rate within TP-9 was 0.97 inches per hour (iph) based upon an average rate of drop of 0.485 inches over the four 30-minute infiltration readings.

Limiting Zone Investigation Results					
Test Pit	Elevation (MSL ft)	Seasonal High Water Table (in)	Water Table (in)	Bedrock (in)	Total Depth (in)
TP-5A	1277	26"	48"	Not encountered	44"
TP-6A	1290	30"	48"	Not encountered	70"
TP-7A	1288	18"	30"	Not encountered	58"

Average Site Infiltration Rate and Discussion

Based upon the results of double-ring infiltration testing completed by BAI, the overall average infiltration rate within the proposed infiltration basin area is approximately 0.63 inches per hour. We feel this rate is representative of the infiltration rate for the LaB soils at depths up to 28 inches, within the potential infiltration BMP areas.

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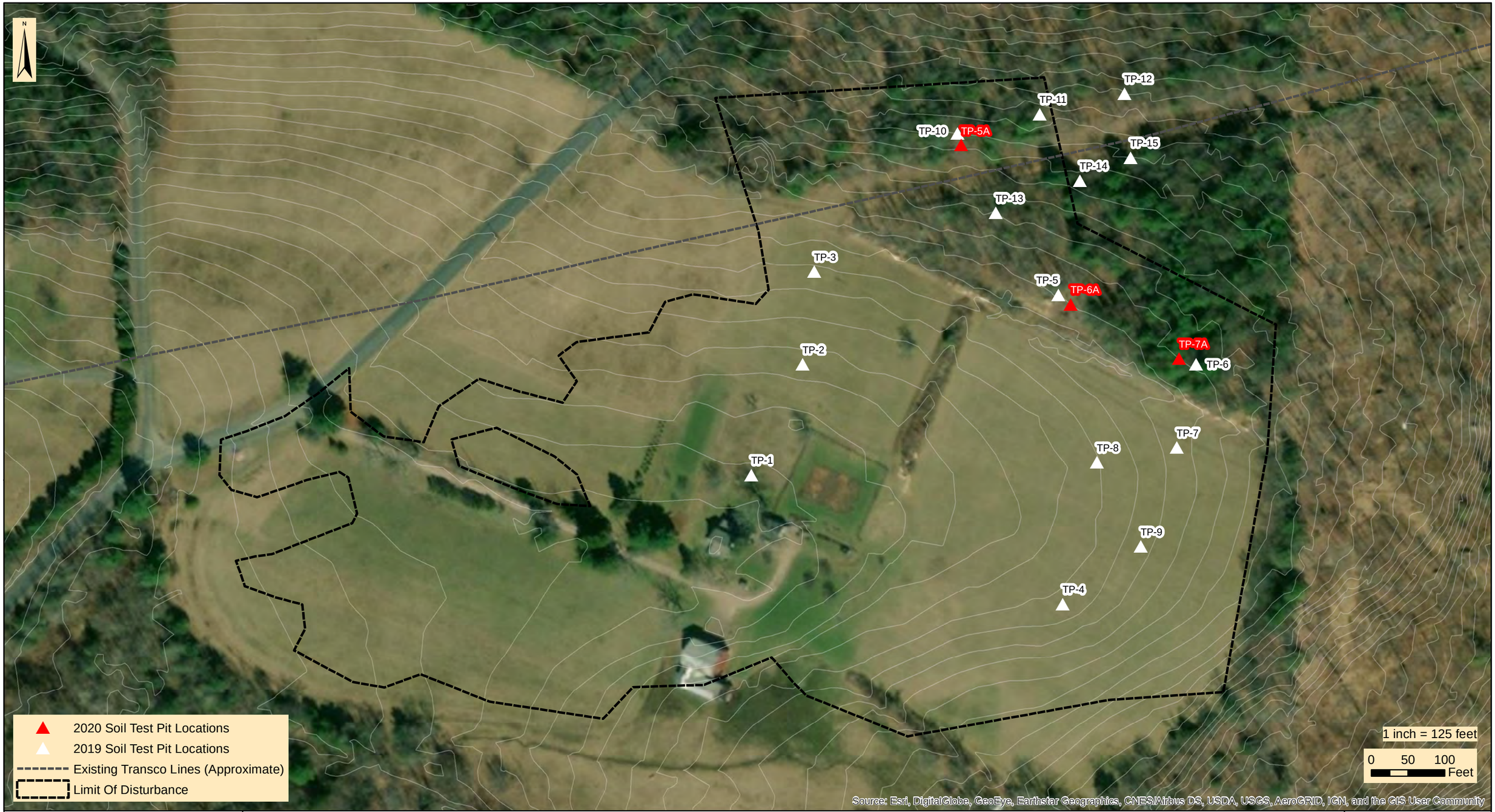

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH - COMPRESSOR STATION 607

SOIL TEST PIT LOCATIONS

LUZERNE COUNTY

PENNSYLVANIA

Date:	05/22/20
WHM DRAWING NUMBER:	WILLIAMS204B001_IT
Drawn By:	BWH
Figure Number:	1

ATTACHMENT 4

PCSM PLAN BMP DESIGN WORKSHEETS AND CALCULATIONS

TABLE OF CONTENTS

Attachment *(Revised May 2020)*

4.1 Stormwater BMP Manual Appendix D Worksheets

4.2 Channel Design Worksheets (Standard E&S Worksheet #11)

4.3 Outlet Basin Design Worksheets

4.4 Riprap Apron Design Worksheets

4.5 Culvert Schedule

4.6 HydroCAD Report

ATTACHMENT 4.1

STORMWATER BMP MANUAL APPENDIX D WORKSHEETS

Appendix D. Worksheets- Compressor Station 607

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 12/06/2019

Project Name: Leidy South – Compressor Station 607

Municipality: Township of Fairmount

County: Luzerne

Total Area (acres): 19.67

Major River Basin: Susquehanna River

Watershed: Huntington Creek

Sub-Basin: Lick Branch

Nearest Surface Water(s) to Receive Runoff: Lick Branch, Philips Creek

Chapter 93 – Designated Water Use/Existing Water Use: HQ, CWF, MF

Impaired according to Category 4 or 5 of the Integrated Water Quality Monitoring and Assessment Report? Yes ☒ No ☐

List Causes of Impairment: Abandoned Mine Drainage-Metals/pH; Atmospheric Deposition-pH;

Is there an established TMDL that applies: Yes ☐ No ☒

Total Maximum Daily Loads (TMDLS)

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☒

Existing or planned drinking water supply? Yes ☐ No ☒

If yes, distance from proposed discharge (miles):

Approved Act 167 Plan? Yes ☒ No ☐

Existing River Conservation Plan? Yes ☐ No ☒

Worksheet 2. Sensitive Natural Resources from PA Stormwater Best Management Practices Chapter 5

INSTRUCTIONS

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	n/a		
Floodplains	n/a		
Riparian Areas	n/a		
Wetlands	n/a		
Woodlands	n/a		
Natural Drainage Ways	n/a		
Steep Slopes, 15% - 25%	n/a		
Steep Slopes, over 25%	n/a		
Other:			
Other:			
TOTAL EXISTING:		**0**	**0**

Worksheet 3. Nonstructural BMP Credits from PA Stormwater Best Management Practices Manual (SW BMP Manual)

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) _____ **Ac.**

1.2 Area of Riparian Forest Buffer Protection (see WS 2) _____ **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading (See Chapter 8, page 21 – SW BMP Manual) _____ **Ac**

TOTAL 0 **Ac**

Site Area	Minus	Protected Area	=	Stormwater Management Area
19.67	-	0	=	19.67

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction (See Chapter 8, page 22 – SW BMP Manual)

Lawn _____ ft^2 x 1/4" x 1/12 = _____ ft^3

_____

Meadow _____ ft^2 x 1/3" x 1/12 = _____ ft^3

3.3 Protect Existing Trees (See Chapter 8, page 23 – SW BMP Manual)

For Trees within 100 feet of impervious area:

Tree Canopy _____ ft^2 x 1/2" x 1/12 = _____ ft^3

_____ _____

5.1 Disconnect Roof Leaders to Vegetated Areas (See Chapter 8 page 25 – SW BMP Manual)

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Roof Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

5.2 Disconnect Non-Roof impervious to Vegetated Areas (See Chapter 8, page 26 – SW BMP Manual)

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Impervious Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

TOTAL NON-STRUCTURAL VOLUME CREDIT* _____ ft

**For use on Worksheet 5*

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Leidy South – Compressor Station 607
Drainage Area: 19.67 acres
2-Year Rainfall: 2.88 in

Total Site Area: 19.67 acres
Protected Site Area: 0 acres
Managed Area: 19.67 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Impervious	LaC/C	10,977	0.252	89	1.24	0.25	1.79	1,639
Impervious	WIB/D	9,235	0.212	91	0.99	0.20	1.96	1,508
Meadow	WIB/D	198,503	4.557	78	2.82	0.56	1.04	17,273
Meadow	LaC/C	504,076	11.572	71	4.08	0.82	0.69	29,084
Woods	LaC/C	109,597	2.516	77	2.99	0.60	0.99	9,030
Woods	WIB/D	24,219	0.556	79	2.66	0.53	1.10	2,223
TOTAL:		856,607	19.67				7.58	60,757

Developed Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Impervious	LaC/C	192,622	4.422	89	1.24	0.25	1.79	28,760
Impervious	WIB/D	10,803	0.248	91	0.99	0.20	1.96	1,764
Meadow	WIB/D	205,647	4.721	78	2.82	0.56	1.04	17,894
Meadow	LaB/C	369,694	8.487	71	4.08	0.82	0.69	21,330
Woods	LaB/C	68,563	1.574	77	2.99	0.60	0.99	5,649
Woods	WIB/D	9,278	0.213	79	2.66	0.53	1.00	852
TOTAL:		856,607	19.67				6.19	76,250

2-Year Volume Increase (ft3): 15,493

2-Year Volume Increase = Developed Conditions Runoff Volume – Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 5. Structural BMP Volume Credits

PROJECT: Leidy South – Compressor Station 607
SUB-BASIN: Middle Susquehanna Subbasin

Required Control Volume (ft^3) – *from Worksheet 4*: 15,684

Non-structural Volume Credit (ft^3) – *from Worksheet 3*: - 0
(maximum is 25% of required volume)

Structural Volume Reqmt (ft^3) 15,684

(Required Control Volume minus Non-structural Credit)

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 6		Area (ft^2)	Volume Reduction Permanently Removed (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin	898	7,237
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin	22,471	105,566
6.7.1	Riparian Buffer/Riparian Forest Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): 112,803
Structural Volume Requirement (ft^3): 15,493
DIFFERENCE 97,310

Stormwater BMP Manual Appendix D. Worksheets
Compressor Station 607

Worksheet 10 – Water Quality Compliance for Nitrate		
Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the equivalent) "provided across the site" is taken to mean the specifications for that BMP set forward in Sections 5 and 6 are satisfied. Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 5 & 6		
	Yes	**No**
Primary BMPs for Nitrate:	☐	☐
NS BMP 5.4.2 – Protect/Conserve/Enhance Riparian Buffers	☐	☐
NS BMP 5.5.4 – Cluster Uses at Each Site	☐	☐
NS BMP 5.6.1 – Minimize Total Disturbed Area	☒	☐
NS BMP 5.6.3 – Re-Vegetate/Re-Forest Disturbed Areas (Native Species)	☒	☐
NS BMP 5.9.1 – Street Sweeping/Vacuuming	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☒	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
	☐	☐
Secondary BMPs for Nitrate:	☐	☐
NS BMP 5.4.1 – Protect Sensitive/Special Value Features	☒	☐
NS BMP 5.4.3 – Protect/Utilize Natural Drainage Features	☒	☐
NS BMP 5.6.2 – Minimize Soil Compaction	☐	☐
Structural BMP 6.4.5 – Rain Garden/Bioretention	☐	☐
Structural BMP 6.4.8 – Vegetated Swale	☐	☐
Structural BMP 6.4.9 – Vegetated Filter Strip	☐	☐
Structural BMP 6.6.1 – Constructed Wetland	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☒	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
Structural BMP 6.7.3 – Soil Amendment/Restoration	☐	☐

ATTACHMENT 4.2
CHANNEL DESIGN WORKSHEETS

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South-Compressor Station 607 Prepared by: FPV, 05/2020
LOCATION: Fairmount Township, Luzerne County, Pennsylvania Checked by: KCC, 05/2020

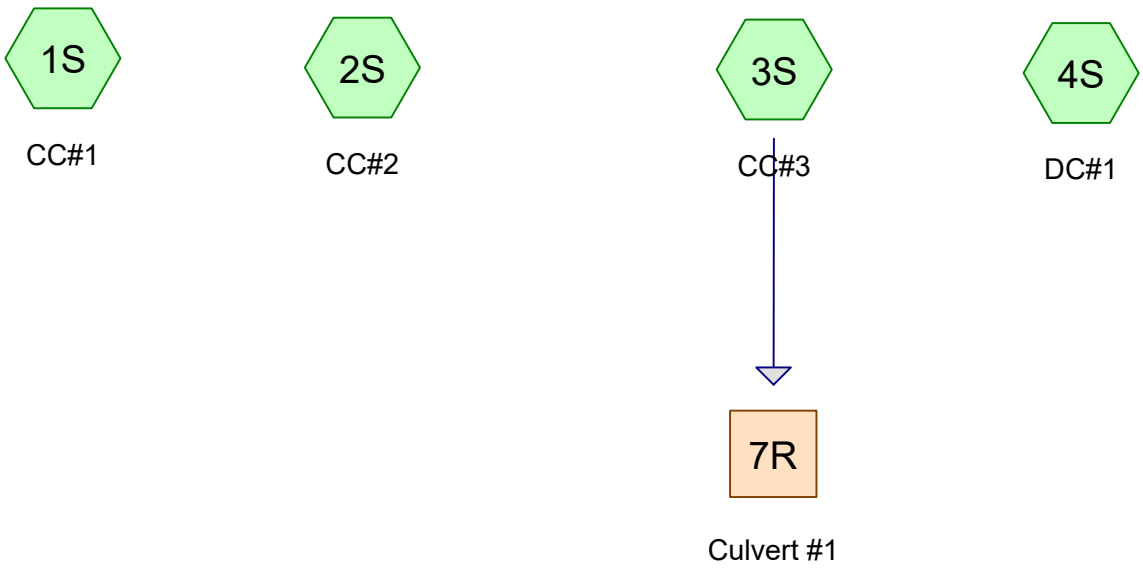
CHANNEL OR CHANNEL SECTION		CC #1	CC #1	CC #2	CC #2
TEMPORARY OR PERMANENT?	(T OR P)	P	P	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 YR	10 YR	10 YR	10 YR
ACRES	(AC)	1.23	1.23	0.60	0.60
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	6.34	6.34	2.54	2.54
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	9.28	10.44	4.04	4.19
PROTECTIVE LINING[2]		ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM
n (MANNING'S COEFFICIENT)[2]		0.040	0.042	0.040	0.048
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15.0	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.5	3.5	2.8	2.5
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.5	8.0	2.5	8.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.2	1.3	0.8	0.9
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	4	4	4	4
D (TOTAL DEPTH)	(FT)	2.00	2.00	2.00	2.00
CHANNEL TOP WIDTH @ D	(FT)	18.0	18.0	18.0	18.0
d (CALCULATED FLOW DEPTH)	(FT)	0.60	0.65	0.40	0.45
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	6.80	7.20	5.20	5.60
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	3.33	3.08	5.00	4.44
d_{50} STONE SIZE	(IN)	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.64	2.99	1.44	1.71
R (HYDRAULIC RADIUS)		0.38	0.40	0.272	0.299
S (BED SLOPE)[3]	(FT/FT)	0.033	0.033	0.032	0.032
S_c (CRITICAL SLOPE)	(FT/FT)	0.033	0.036	0.037	0.053
$.7S_c$	(FT/FT)	0.023	0.025	0.017	0.025
$1.3S_c$	(FT/FT)	0.043	0.046	0.048	0.069
STABLE FLOW?	(Y/N)	N	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.15	0.17	0.08	--
FREEBOARD BASED ON STABLE FLOW	(FT)	--	--	--	0.11
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V

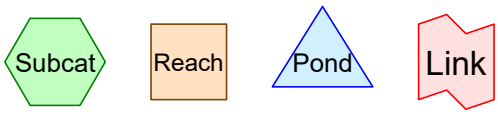
1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

* Due to PADEP Stormwater BMP design requirements for vegetated swales, the bottom width:flow depth ratio is above 12:1 max for each scenario for the 10-yr storm event.

CHANNEL OR CHANNEL SECTION		CC #3	DC #1	DC #1
TEMPORARY OR PERMANENT?	(T OR P)	P	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 YR	10 YR	10 YR
ACRES	(AC)	1.84	1.16	1.16
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	8.21	1.43	1.43
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	10.07	2.02	1.82
PROTECTIVE LINING[2]		R-3 Riprap	ECM (SC250)	Vegetated ECM
n (MANNING'S COEFFICIENT)[2]		0.039	0.040	0.059
V_a (ALLOWABLE VELOCITY)	(FPS)	6.5	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.5	2.1	1.5
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.0	2.5	8.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.0	0.5	0.5
CHANNEL BOTTOM WIDTH	(FT)	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	4	4
D (TOTAL DEPTH)	(FT)	6.00	2.00	2.00
CHANNEL TOP WIDTH @ D	(FT)	26.00	18.00	18.00
d (CALCULATED FLOW DEPTH)	(FT)	0.80	0.30	0.35
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	5.20	4.40	4.80
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	2.50	6.67	5.71
d_{50} STONE SIZE	(IN)	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.88	0.96	1.19
R (HYDRAULIC RADIUS)		0.516	0.215	0.244
S (BED SLOPE)[3]	(FT/FT)	0.020	0.025	0.025
S_c (CRITICAL SLOPE)	(FT/FT)	0.029	0.040	0.085
$.7S_c$	(FT/FT)	0.020	0.028	0.060
$1.3S_c$	(FT/FT)	0.038	0.051	0.111
STABLE FLOW?	(Y/N)	Y	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.20	0.07	0.09
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V

HYDROCAD CHANNEL PEAK FLOW CALCULATIONS





Routing Diagram for Station 607-channel_R3
Prepared by {enter your company name here}, Printed 5/21/2020
HydroCAD® 10.00-25 s/n 09710 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.005	89	Gravel roads, HSG C (1S, 2S, 3S)
0.776	71	Meadow, non-grazed, HSG C (1S, 2S, 3S, 4S)
0.935	78	Meadow, non-grazed, HSG D (4S)
0.059	73	Woods, Fair, HSG C (4S)
0.059	79	Woods, Fair, HSG D (4S)
4.834	**84**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.840	HSG C	1S, 2S, 3S, 4S
0.994	HSG D	4S
0.000	Other	
4.834		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	3.005	0.000	0.000	3.005	Gravel roads	1S, 2S, 3S
0.000	0.000	0.776	0.935	0.000	1.711	Meadow, non-grazed	1S, 2S, 3S, 4S
0.000	0.000	0.059	0.059	0.000	0.118	Woods, Fair	4S
0.000	**0.000**	**3.840**	**0.994**	**0.000**	**4.834**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: CC#1 Runoff Area=1.234 ac 0.00% Impervious Runoff Depth>2.59"
Flow Length=477' Tc=3.1 min CN=87 Runoff=6.34 cfs 0.266 af

Subcatchment 2S: CC#2 Runoff Area=26,176 sf 0.00% Impervious Runoff Depth>2.32"
Flow Length=814' Tc=6.5 min CN=84 Runoff=2.54 cfs 0.116 af

Subcatchment 3S: CC#3 Runoff Area=1.841 ac 0.00% Impervious Runoff Depth>2.50"
Flow Length=723' Tc=6.3 min CN=86 Runoff=8.21 cfs 0.383 af

Subcatchment 4S: DC#1 Runoff Area=1.158 ac 0.00% Impervious Runoff Depth>1.74"
Flow Length=1,211' Tc=45.7 min CN=77 Runoff=1.43 cfs 0.168 af

Total Runoff Area = 4.834 ac Runoff Volume = 0.934 af Average Runoff Depth = 2.32"
100.00% Pervious = 4.834 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: CC#1

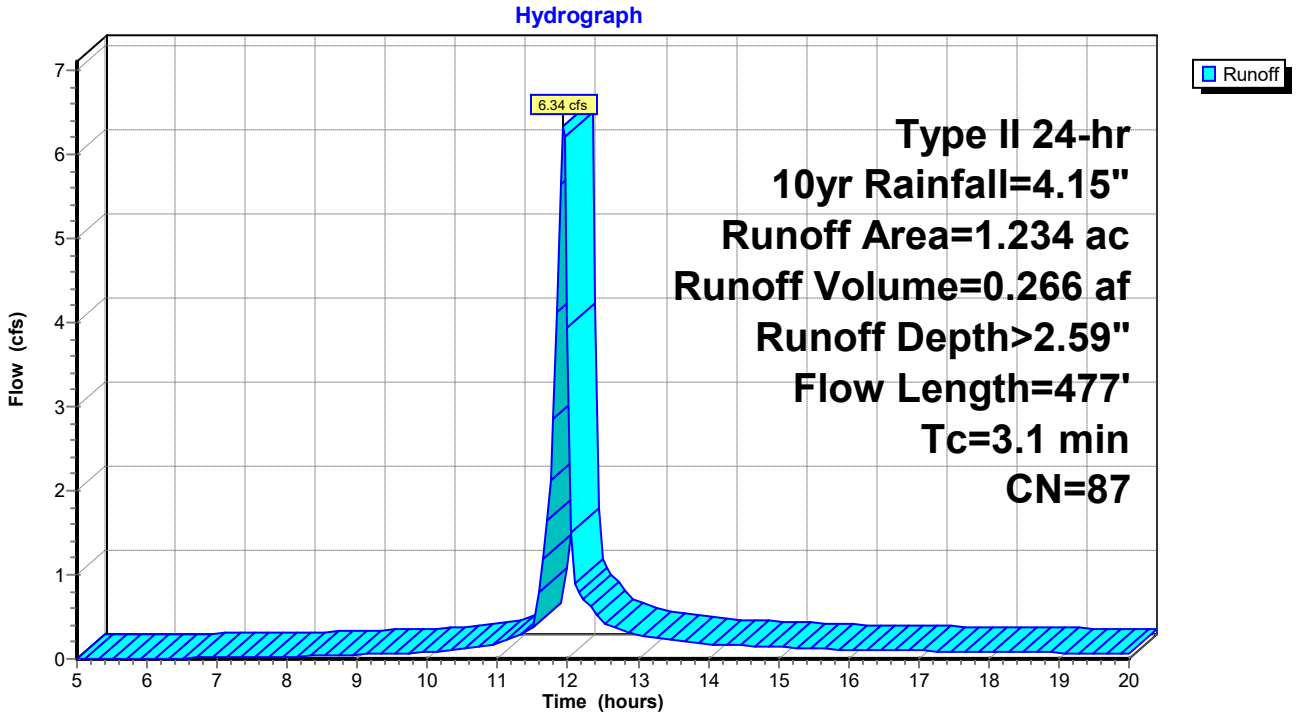
Runoff = 6.34 cfs @ 11.93 hrs, Volume= 0.266 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

Area (ac)	CN	Description
0.156	71	Meadow, non-grazed, HSG C
1.078	89	Gravel roads, HSG C
1.234	87	Weighted Average
1.234		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	166	0.0079	1.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	311	0.0325	3.25	8.45	**Channel Flow,** Area= 2.6 sf Perim= 6.9' r= 0.38' n= 0.043
3.1	477	Total			

Subcatchment 1S: CC#1



Hydrograph for Subcatchment 1S: CC#1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.01
6.50	0.37	0.00	0.01
6.75	0.39	0.01	0.01
7.00	0.41	0.01	0.01
7.25	0.43	0.01	0.02
7.50	0.45	0.01	0.02
7.75	0.48	0.02	0.02
8.00	0.50	0.02	0.02
8.25	0.52	0.03	0.03
8.50	0.55	0.04	0.04
8.75	0.58	0.04	0.04
9.00	0.61	0.05	0.05
9.25	0.64	0.06	0.06
9.50	0.68	0.08	0.06
9.75	0.71	0.09	0.07
10.00	0.75	0.11	0.08
10.25	0.80	0.12	0.10
10.50	0.85	0.15	0.12
10.75	0.91	0.18	0.15
11.00	0.98	0.21	0.19
11.25	1.06	0.26	0.26
11.50	1.17	0.32	0.35
11.75	1.61	0.61	**2.13**
12.00	2.75	1.52	**3.93**
12.25	2.93	1.68	0.69
12.50	3.05	1.78	0.44
12.75	3.13	1.86	0.35
13.00	3.20	1.92	0.29
13.25	3.26	1.97	0.25
13.50	3.32	2.02	0.22
13.75	3.36	2.06	0.20
14.00	3.40	2.10	0.18
14.25	3.44	2.13	0.16
14.50	3.48	2.16	0.16
14.75	3.51	2.19	0.15
15.00	3.54	2.22	0.14
15.25	3.57	2.25	0.13
15.50	3.60	2.27	0.13
15.75	3.63	2.30	0.12
16.00	3.65	2.32	0.11
16.25	3.68	2.34	0.11
16.50	3.70	2.36	0.10
16.75	3.72	2.38	0.10
17.00	3.74	2.40	0.10
17.25	3.76	2.42	0.09
17.50	3.78	2.44	0.09
17.75	3.80	2.46	0.09
18.00	3.82	2.47	0.09
18.25	3.84	2.49	0.08
18.50	3.86	2.51	0.08
18.75	3.88	2.52	0.08
19.00	3.89	2.54	0.07
19.25	3.91	2.55	0.07
19.50	3.92	2.57	0.07
19.75	3.94	2.58	0.06
20.00	**3.95**	**2.59**	0.06

Summary for Subcatchment 2S: CC#2

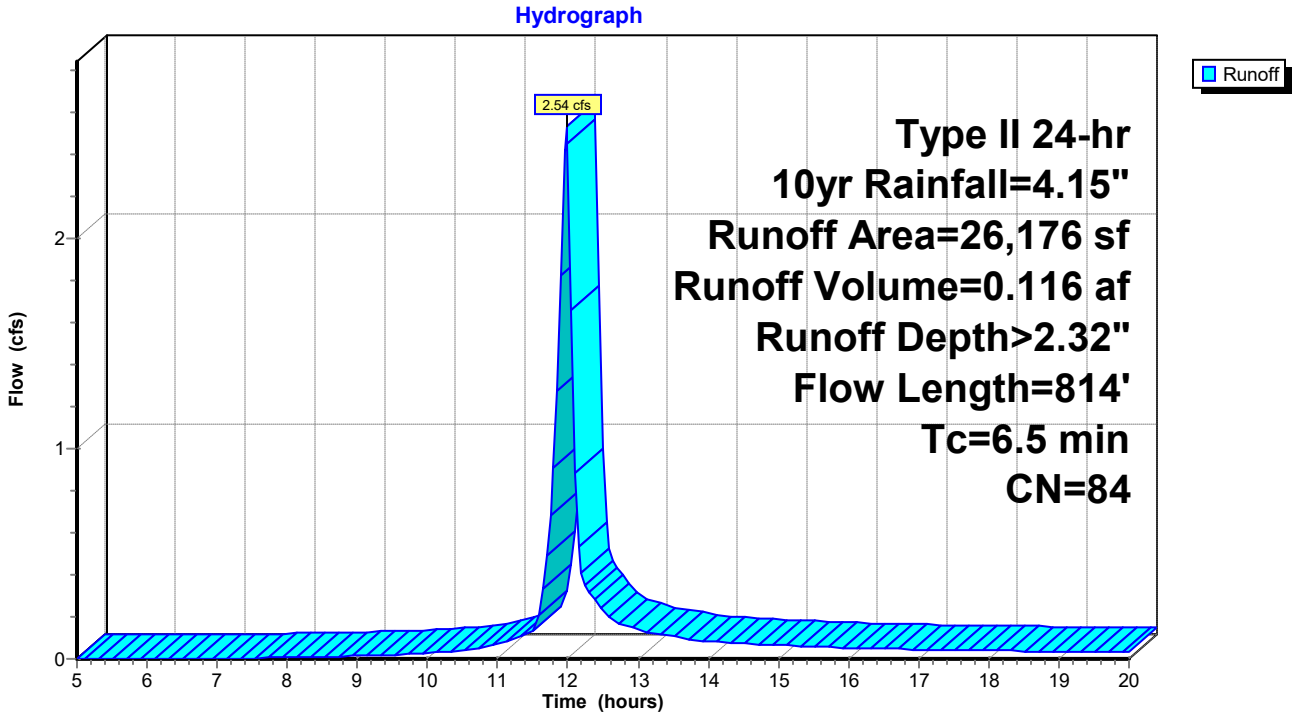
Runoff = 2.54 cfs @ 11.98 hrs, Volume= 0.116 af, Depth> 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

Area (sf)	CN	Description
7,071	71	Meadow, non-grazed, HSG C
19,105	89	Gravel roads, HSG C
26,176	84	Weighted Average
26,176		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	414	0.0096	1.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	400	0.0324	2.21	3.76	**Channel Flow,** Area= 1.7 sf Perim= 5.7' r= 0.30' n= 0.054
6.5	814	Total			

Subcatchment 2S: CC#2



Hydrograph for Subcatchment 2S: CC#2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.00
6.75	0.39	0.00	0.00
7.00	0.41	0.00	0.00
7.25	0.43	0.00	0.00
7.50	0.45	0.00	0.00
7.75	0.48	0.00	0.00
8.00	0.50	0.01	0.01
8.25	0.52	0.01	0.01
8.50	0.55	0.01	0.01
8.75	0.58	0.02	0.01
9.00	0.61	0.02	0.02
9.25	0.64	0.03	0.02
9.50	0.68	0.04	0.02
9.75	0.71	0.05	0.02
10.00	0.75	0.06	0.03
10.25	0.80	0.07	0.03
10.50	0.85	0.09	0.04
10.75	0.91	0.11	0.05
11.00	0.98	0.14	0.07
11.25	1.06	0.18	0.10
11.50	1.17	0.23	0.13
11.75	1.61	0.48	0.68
12.00	2.75	1.31	**2.45**
12.25	2.93	1.46	0.35
12.50	3.05	1.56	0.23
12.75	3.13	1.63	0.17
13.00	3.20	1.69	0.14
13.25	3.26	1.74	0.12
13.50	3.32	1.78	0.11
13.75	3.36	1.82	0.09
14.00	3.40	1.85	0.08
14.25	3.44	1.89	0.08
14.50	3.48	1.92	0.07
14.75	3.51	1.95	0.07
15.00	3.54	1.97	0.07
15.25	3.57	2.00	0.06
15.50	3.60	2.02	0.06
15.75	3.63	2.05	0.06
16.00	3.65	2.07	0.05
16.25	3.68	2.09	0.05
16.50	3.70	2.11	0.05
16.75	3.72	2.13	0.05
17.00	3.74	2.15	0.05
17.25	3.76	2.16	0.04
17.50	3.78	2.18	0.04
17.75	3.80	2.20	0.04
18.00	3.82	2.22	0.04
18.25	3.84	2.23	0.04
18.50	3.86	2.25	0.04
18.75	3.88	2.26	0.04
19.00	3.89	2.28	0.03
19.25	3.91	2.29	0.03
19.50	3.92	2.30	0.03
19.75	3.94	2.32	0.03
20.00	**3.95**	**2.33**	0.03

Summary for Subcatchment 3S: CC#3

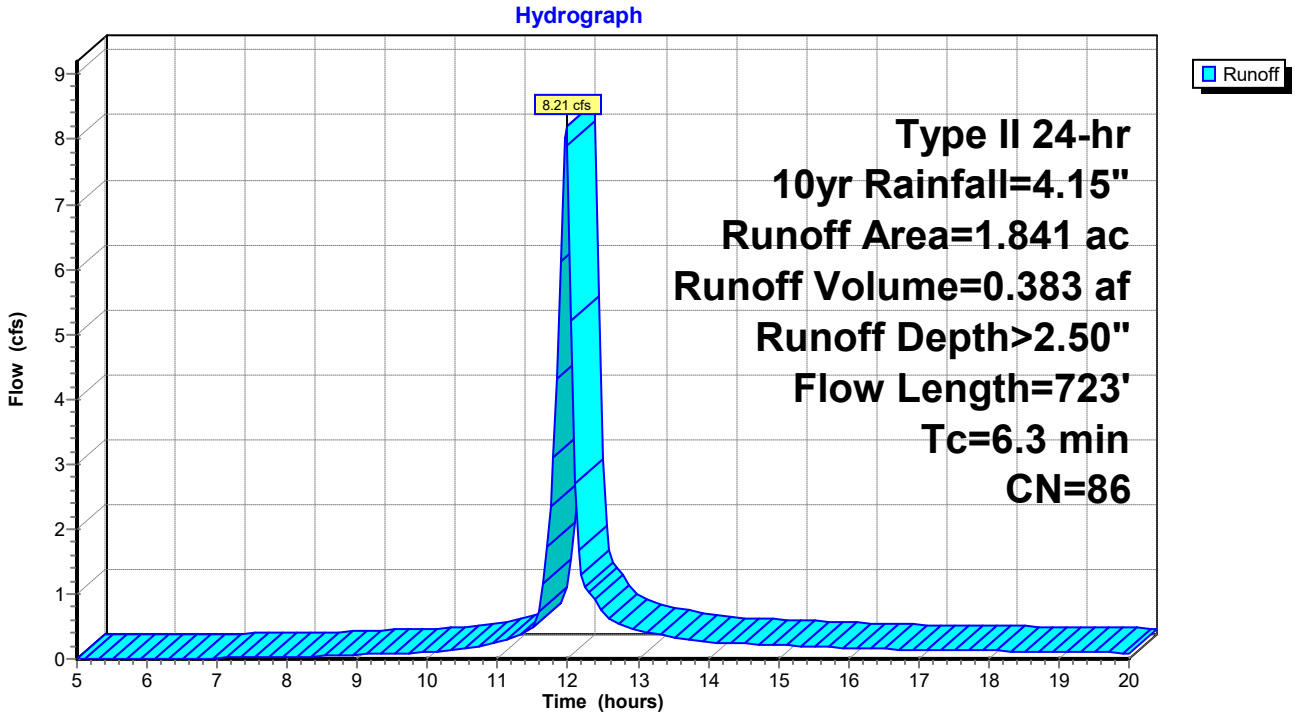
Runoff = 8.21 cfs @ 11.97 hrs, Volume= 0.383 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

Area (ac)	CN	Description
1.488	89	Gravel roads, HSG C
0.353	71	Meadow, non-grazed, HSG C
1.841	86	Weighted Average
1.841		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	166	0.0096	1.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.9	557	0.0200	1.88	3.20	**Channel Flow,** Area= 1.7 sf Perim= 5.2' r= 0.33' n= 0.053
6.3	723	Total			

Subcatchment 3S: CC#3



Hydrograph for Subcatchment 3S: CC#3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.01
6.75	0.39	0.00	0.01
7.00	0.41	0.00	0.01
7.25	0.43	0.01	0.02
7.50	0.45	0.01	0.02
7.75	0.48	0.01	0.03
8.00	0.50	0.02	0.03
8.25	0.52	0.02	0.04
8.50	0.55	0.03	0.04
8.75	0.58	0.03	0.05
9.00	0.61	0.04	0.06
9.25	0.64	0.05	0.07
9.50	0.68	0.06	0.08
9.75	0.71	0.07	0.09
10.00	0.75	0.09	0.11
10.25	0.80	0.11	0.13
10.50	0.85	0.13	0.16
10.75	0.91	0.15	0.20
11.00	0.98	0.19	0.25
11.25	1.06	0.23	0.34
11.50	1.17	0.29	0.47
11.75	1.61	0.56	**2.36**
12.00	2.75	1.45	**7.91**
12.25	2.93	1.60	1.12
12.50	3.05	1.71	0.72
12.75	3.13	1.78	0.53
13.00	3.20	1.84	0.44
13.25	3.26	1.89	0.38
13.50	3.32	1.94	0.34
13.75	3.36	1.98	0.30
14.00	3.40	2.01	0.26
14.25	3.44	2.05	0.24
14.50	3.48	2.08	0.23
14.75	3.51	2.11	0.22
15.00	3.54	2.14	0.21
15.25	3.57	2.16	0.20
15.50	3.60	2.19	0.19
15.75	3.63	2.21	0.17
16.00	3.65	2.23	0.16
16.25	3.68	2.25	0.16
16.50	3.70	2.27	0.15
16.75	3.72	2.29	0.15
17.00	3.74	2.31	0.14
17.25	3.76	2.33	0.14
17.50	3.78	2.35	0.13
17.75	3.80	2.37	0.13
18.00	3.82	2.39	0.13
18.25	3.84	2.40	0.12
18.50	3.86	2.42	0.12
18.75	3.88	2.43	0.11
19.00	3.89	2.45	0.11
19.25	3.91	2.46	0.11
19.50	3.92	2.48	0.10
19.75	3.94	2.49	0.10
20.00	**3.95**	**2.50**	0.09

Summary for Subcatchment 4S: DC#1

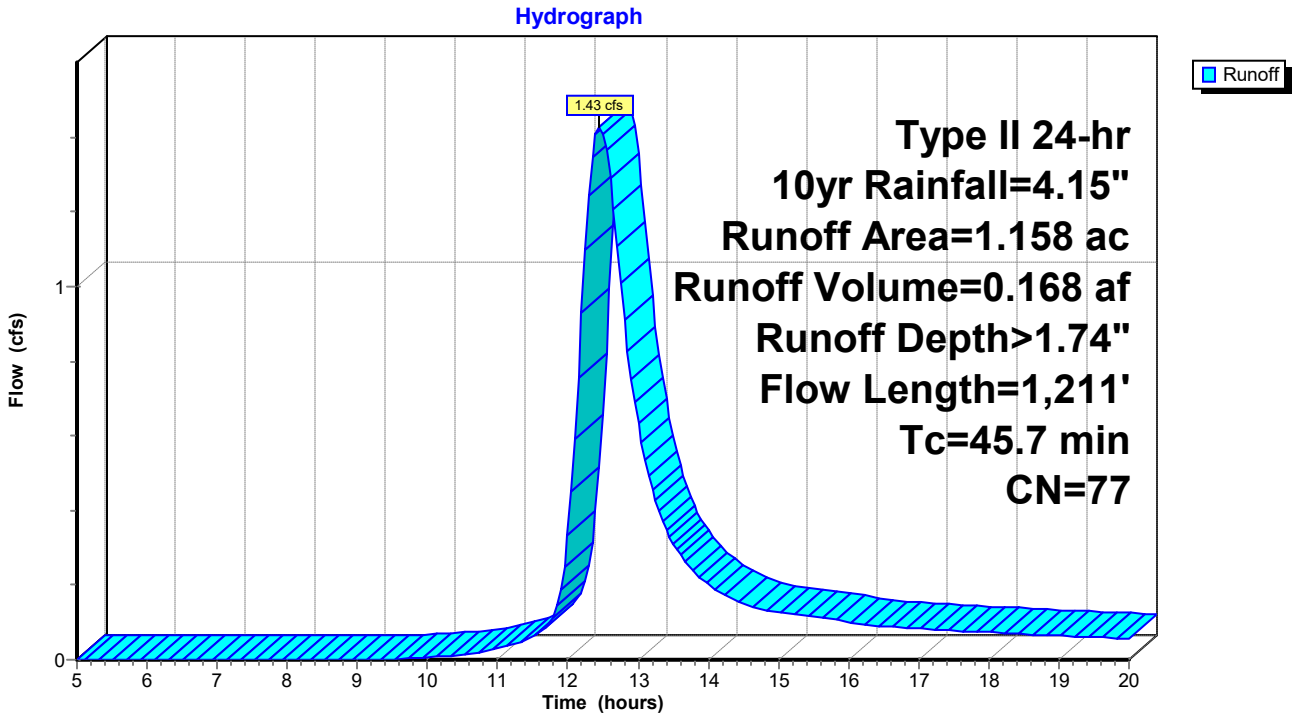
Runoff = 1.43 cfs @ 12.45 hrs, Volume= 0.168 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

Area (ac)	CN	Description
0.059	73	Woods, Fair, HSG C
0.059	79	Woods, Fair, HSG D
0.105	71	Meadow, non-grazed, HSG C
0.935	78	Meadow, non-grazed, HSG D
1.158	77	Weighted Average
1.158		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	179	0.0254	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
7.7	489	0.0227	1.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.2	543	0.0240	1.73	2.08	**Channel Flow,** Area= 1.2 sf Perim= 4.9' r= 0.24' n= 0.052
45.7	1,211	Total			

Subcatchment 4S: DC#1



Hydrograph for Subcatchment 4S: DC#1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.00
6.75	0.39	0.00	0.00
7.00	0.41	0.00	0.00
7.25	0.43	0.00	0.00
7.50	0.45	0.00	0.00
7.75	0.48	0.00	0.00
8.00	0.50	0.00	0.00
8.25	0.52	0.00	0.00
8.50	0.55	0.00	0.00
8.75	0.58	0.00	0.00
9.00	0.61	0.00	0.00
9.25	0.64	0.00	0.00
9.50	0.68	0.00	0.00
9.75	0.71	0.00	0.00
10.00	0.75	0.01	0.01
10.25	0.80	0.01	0.01
10.50	0.85	0.02	0.01
10.75	0.91	0.03	0.02
11.00	0.98	0.04	0.03
11.25	1.06	0.06	0.04
11.50	1.17	0.09	0.06
11.75	1.61	0.25	0.10
12.00	2.75	0.90	0.33
12.25	2.93	1.02	**1.10**
12.50	3.05	1.11	**1.41**
12.75	3.13	1.16	1.01
13.00	3.20	1.21	0.63
13.25	3.26	1.26	0.43
13.50	3.32	1.30	0.31
13.75	3.36	1.33	0.24
14.00	3.40	1.36	0.20
14.25	3.44	1.39	0.17
14.50	3.48	1.41	0.15
14.75	3.51	1.44	0.14
15.00	3.54	1.46	0.13
15.25	3.57	1.48	0.12
15.50	3.60	1.51	0.11
15.75	3.63	1.53	0.11
16.00	3.65	1.54	0.10
16.25	3.68	1.56	0.10
16.50	3.70	1.58	0.09
16.75	3.72	1.60	0.09
17.00	3.74	1.61	0.08
17.25	3.76	1.63	0.08
17.50	3.78	1.64	0.08
17.75	3.80	1.66	0.08
18.00	3.82	1.67	0.07
18.25	3.84	1.69	0.07
18.50	3.86	1.70	0.07
18.75	3.88	1.72	0.07
19.00	3.89	1.73	0.06
19.25	3.91	1.74	0.06
19.50	3.92	1.75	0.06
19.75	3.94	1.76	0.06
20.00	**3.95**	**1.77**	0.06

CHANNEL LINING-
MANUFACTURER'S SPECIFICATIONS

ROLLMAX™
ROLLED EROSION CONTROL

ROLLED
EROSION CONTROL

SYSTEMS BROCHURE

Tensar®

When It Rains (or Blows, Flows or Washes), It Pours

Erosion not only wears away slopes, degrades shorelines and steals precious topsoil, it can also threaten water sources, damage man-made structures, reconfigure landscapes and disrupt wildlife habitats. Add the stiff penalties at stake for violating Environmental Protection Agency (EPA) or local enforcement agency regulations, and the costs of erosion can quickly climb out of control.

WE ROLL AGAINST THE FLOW

Tensar International Corporation (Tensar) is the world's leading provider of performance-guaranteed erosion control solutions. For more than 25 years, the Tensar® North American Green® line of erosion and sediment control products has kept our customers on solid ground.

The RollMax™ Systems' family of Rolled Erosion Control Products (RECPs) is solid evidence of Tensar's ongoing investment in innovation. Our short-term and long-term erosion control blankets and turf reinforcement mats keep you one step ahead of just about any erosion challenge.

ALL THE HELP YOU NEED

Of all the RECP manufacturers out there, none can match Tensar's customer service and technical knowhow. Our support team will assist with project design and product specification or, if you'd rather do it yourself, use our Erosion Control Materials Design Software (ECMDS®) (the industry's first) for selecting material, and planning your project.

Tensar products are sold exclusively through nearly 200 Tensar Erosion Control authorized distributors worldwide. The Tensar Erosion Solutions Specialist program certifies our distributors and their sales representatives to design erosion control measures that comply with the EPA's National Pollutant Discharge Elimination System (NPDES) and other industry regulations.

Tensar is a proud member of the Erosion Control Technology Council (ECTC) and the International Erosion Control Association (IECA).

NEW NAME – SAME GREAT PERFORMANCE AND SERVICE

Tensar International Corporation acquired North American Green (NAG) in 2004 to enhance our position as the premier provider of technology-driven site solutions. We are proud to continue offering the same NAG level of service, quality and high-performance erosion control products under the name of Tensar.

Site erosion can be costly, with the RollMax Systems full line of rolled erosion control products we can keep you in compliance.

For more than 25 years, our Tensar North American Green line of products has kept our customers on solid ground.

Applications Welcome

For nearly every erosion application, there's a RollMax™ Systems solution. Permanent turf reinforcement mats provide long-term protection and vegetation establishment; temporary Erosion Control Blankets (ECBs) give immediate protection and assist with vegetation establishment before degrading naturally. Tensar's extensive selection of RollMax products almost guarantees you'll find the answer to your erosion problems.

Typical erosion control applications include these and many more:

- Highway and other DOT projects
- Commercial and residential developments
- Shorelines and waterways
- Golf course turf management
- Oil and gas pipeline restoration
- Mine and fire reclamation
- Military base construction

AND SPEAKING OF GUARANTEES . . .

Tensar's Ultimate Assurance Guarantee is the most comprehensive in the industry. It says if any properly specified and installed Tensar® North American Green® rolled erosion control product designed by a qualified engineer or Tensar technical representative in accordance with our Erosion Control Materials Design Software (ECMDS®) fails to perform under the conditions in the Guarantee, then we will replace the failed product with our next higher-performance RECP product, along with the cost of seed, fertilizer, topsoil and other amendments lost due to such product failure. Our Guarantee warrants in accordance with its terms and conditions all registered projects designed with the latest version of our ECMDS and properly installed.

Tensar turf reinforcement mats are also guaranteed to reinforce vegetation for five years after installation, and the functional longevity of these products' permanent structures is warranted for a minimum of 10 years after installation, subject to the terms and conditions set forth in the Guarantee.

From challenging roadway improvements to concentrated flow channels, there is a RollMax product ready to handle the job – and it's guaranteed.

Permanent RollMax™ Solutions

Back in the day, rock riprap, articulated concrete blocks and poured concrete were the only way to deal with erosion in high-flow channels, on shorelines and other areas where water and/or wind exceed the shear limits of unreinforced vegetation.

Not anymore. Tensar's permanent Turf Reinforcement Mats (TRMs) use 100% synthetic components or a composite of synthetic and natural materials for long-term erosion protection and vegetation establishment. Whether compared to rock riprap or concrete, the RollMax™ Systems' permanent TRMs offer a number of significant advantages:

- Prevent loss of precious topsoil to wind and water erosion
- Permanently reinforce vegetation root and stem structures
- Provide excellent conditions for quick, healthy vegetation growth
- Stabilize slopes from erosion to keep roadways safe and clean
- Protect water quality in lakes, rivers and streams
- Protect dormant seeding during winter months
- Easily conform to landscape features
- Lightweight for easy handling and transportation

VMAX® COMPOSITE TURF REINFORCEMENT MATS

VMax® C-TRMs combine three-dimensional matting with fiber matrix material for permanent erosion control on severe slopes, spillways, stream banks, shorelines and in high- to extreme-flow channels. These extensively tested products provide maximum performance through all three phases of reinforced vegetative lining development: unvegetated, establishment, and maturity. Incorporating the best performance features of temporary and permanent Tensar erosion control products, VMax C-TRMs deliver these tangible benefits:

- Surface-applied for the highest level of immediate soil protection
- Less than one third of the installed cost of rock or concrete
- No heavy equipment needed to install
- More attractive and effective "Green" alternative than rock riprap or concrete
- Exceeds FHWA and ECTC standards for TRMs
- An EPA Best Management Practice (BMP) for National Pollutant Discharge Elimination System (NPDES) regulations
- No threat to pedestrians or automobiles when used near travel routes
- Naturally filters runoff water

The TRMs easily conform to various landscape features to prevent the loss of precious topsoil.

The RollMax TRMs are installed in a one-step operation directly over the prepared seedbed saving time and money and ensuring the highest level of erosion control and vegetation reinforcement.

VMax® P550® Permanent TRM

Our top of the line P550® TRM has a polypropylene fiber matrix augmenting the permanent netting structure with permanent mulching and erosion control performance. Unvegetated, the P550 TRM reduces soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 4.0 lbs/ft^2 (191 Pa). The ultra-strong structure drives the vegetated shear resistance up to 14 lbs/ft^2 (672 Pa), establishing a new maximum for vegetation reinforcement. The P550 TRM may be used as an alternative for poured concrete or articulated concrete blocks in extreme erosion control projects.

VMax® C350® Permanent TRM

A 100% coconut fiber matrix supplements the C350's permanent three-dimensional netting structure with initial mulching and erosion control performance for up to 36 months. Unvegetated, the C350® TRM reduces soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.2 lbs/ft^2 (153 Pa) and boosts permanent vegetation performance up to 12 lbs/ft^2 (576 Pa). This environmentally friendly alternative to 30 in. (76 cm) or larger rock riprap is ideal for severe erosion control projects.

VMax® SC250® Permanent TRM

The SC250® permanent TRM has a 70% straw/30% coconut fiber matrix to enhance initial mulching and erosion control performance for up to 24 months. Unvegetated, SC250 TRMs reduce soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.0 lbs/ft^2, and increases permanent vegetation performance up to 10 lbs/ft^2 (480 Pa) for a green alternative to rock riprap.

ERONET™ PERMANENT EROSION CONTROL BLANKETS

The EroNet™ Permanent ECB provides immediate erosion protection and vegetation establishment assistance until vegetation roots and stems mature.

EroNet™ P300® Permanent Erosion Control Blankets

The P300® permanent erosion control blanket consists of UV-stabilized polypropylene fiber stitched between heavy-weight UV-stabilized polypropylene top and bottom nets. These mats reduce soil loss and protect vegetation from being washed away or uprooted, even under high stress. Unvegetated, they reduce soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.0 lbs/ft^2 (144 Pa), and protect vegetation from being washed away or uprooted when exposed to shear stresses up to 8 lbs/ft^2 (383 Pa).

To boost performance of the VMax turf reinforcement mats in critical applications, combine with our ShoreMax® flexible transition mat to create a system that can dramatically elevate the permissible shear stress and velocity protection beyond many hard armor solutions.

VMax Mats are perfect for pipe outlets, channel bottoms, shoreline transition zones, and other areas subjected to highly turbulent water flows.

Temporary RollMax™ Solutions

Erosion control has never been so simple yet effective. Tensar's RollMax™ temporary Erosion Control Blankets (ECBs) provide immediate erosion protection and vegetation establishment assistance, then degrade once the vegetation's root and stem systems are mature enough to stabilize the soil.

Our high-quality temporary solutions are available in varying functional longevities and materials:

- Short-term photodegradable blankets with a functional longevity of 45 days up to 12 months
- Extended-term and long-term photodegradable blankets for protection up to 36 months
- Short-term biodegradable blankets for protection up to 12 months
- Extended-term and long-term biodegradable products for protection and mulching from 18 to 24 months

ERONET™ EROSION CONTROL BLANKETS

Tensar's EroNet™ ECBs incorporate photodegradable nettings, which means they are broken down by the ultraviolet rays in sunlight. These temporary products can be used in a variety of scenarios, including moderate to steep slopes, medium- to high-flow channels, shorelines and other areas needing protection until permanent vegetation establishment.

EroNet™ C125® Long-Term Photodegradable Double-Net Coconut Blanket

The C125® ECB is made of 100% coconut fiber stitched between heavyweight UV-stabilized polypropylene nets. It offers excellent durability, erosion control and longevity for severe slopes, steep embankments, high-flow channels and other areas where vegetation may take up to 36 months to grow in.

The EroNet temporary ECBs are designed to provide immediate erosion protection and vegetation establishment assistance, and then degrade after the vegetation is mature enough to permanently stabilize the underlying soil. Both short-term and extended-term ECBs are available.

EroNet™ SC150® Extended-Term Photodegradable Double-Net Straw/Coconut Blanket

With a layer of 70% straw and 30% coconut fiber stitched between a heavyweight UV-stabilized polypropylene top net and a lightweight photodegradable polypropylene bottom net, the SC150® ECB has increased durability, erosion control capabilities and longevity. It is suitable for steeper slopes, medium-flow channels and other areas where it may take vegetation up to 24 months to grow in.

EroNet™ S150® Short-Term Photodegradable Double-Net Straw Blanket

The S150 ECB is made with a 100% straw fiber matrix stitched between lightweight photodegradable polypropylene top and bottom nets. The S150 ECB's double-net construction has greater structural integrity than single net blankets for use on steeper slopes and in channels with moderate water flow. It provides erosion protection and mulching for up to 12 months.

EroNet™ DS150™ Ultra Short-Term Photodegradable Double-Net Straw Blanket

The DS150™ ECB is suitable for high maintenance areas where close mowing will occur soon after installation. Special additives in the thread and top and bottom net ensure it degrades in adequate sunlight within 60 days.

EroNet™ S75® Short-Term Photodegradable Single-Net Straw Blanket

The S75® ECB protects and mulches moderate slopes and low-flow channels in low maintenance areas for up to 12 months. It is constructed of 100% straw fiber stitched with degradable thread to a lightweight photodegradable polypropylene top net.

EroNet™ DS75™ Ultra Short-Term Photodegradable Single-Net Straw Blanket

Designed for high maintenance areas where close mowing will occur soon after installation, the DS75™ ECB degrades within 45 days because of special additives in the thread and top net that facilitate rapid breakdown in adequate sunlight.

Every site has its own unique characteristics and challenges. EroNet Erosion Control Blankets are available in varying longevities to suit a variety of scenarios and conditions.

With our Erosion Control Materials Design Software (ECMDS), you can select either short-term, extended-term or long-term EroNet blankets based on your specific design needs.

Temporary RollMax™ Solutions

BIONET® EROSION CONTROL BLANKETS

BioNet® 100% biodegradable ECBs provide effective and all-natural erosion control and vegetation establishment in an environmentally and wildlife friendly manner. All products in the line are made of organic, biodegradable materials perfect for bioengineering applications, environmentally sensitive sites, shaded areas, stream banks and shorelines. Other advantages are:

- Little to no risk of wildlife entrapment
- Easy to sprig or plant through
- High durability, fiber retention and mechanical stability with Leno weave technology
- Increased water absorption with jute netting vs. polypropylene netting
- Improved blanket conformance and adherence to soil vs. polypropylene netting
- Enhanced erosion protection and mulching capabilities vs. polypropylene netting
- Durable, flexible and 100% biodegradable
- Lightweight jute netting requires no direct sunlight exposure to initiate degradation

BioNet® C125BN™ Long-Term Biodegradable Double-Net Coconut Blanket

A dense layer of coconut fiber stitched between jute nettings allows the C125BN™ ECB to provide more effective erosion protection and mulch than open weave coir nettings. This product performs in critical applications for up to 24 months.

BioNet® SC150BN™ Extended-Term Biodegradable Double-Net Straw/Coconut Blanket

The SC150BN™ ECB features a layer of 70% straw and 30% coconut fiber stitched between biodegradable jute top and bottom nettings. It provides erosion protection and mulching for up to 18 months in applications requiring extra strength and erosion control properties.

BioNet® S150BN™ Short-Term Biodegradable Double-Net Straw Blanket

The S150BN™ ECB is used for applications requiring greater durability and performance than a single-net biodegradable ECB can provide. Made with a 100% straw fiber matrix stitched between biodegradable jute top and bottom nettings, it offers up to 12 months of erosion protection and mulching action.

BioNet® S75BN™ Short-Term Biodegradable Single-Net Straw Blanket

Consisting of a 100% straw fiber matrix stitched to a biodegradable jute top nettings, the S75BN™ ECB provides better erosion protection and mulching action than conventional open weave jute nettings alone. The S75BN ECB provides up to 12 months of erosion control and vegetation growth support.

Design and Installation Tools

SHIFT, CONTROL, ENTER

Professional guidance on RECP selection, design and project planning is at your fingertips with Tensar's proprietary Erosion Control Materials Design Software (ECMDS®). This web-based program incorporates design methodologies from the Federal Highway Administration and United States Department of Agriculture to analyze your specific site conditions, and make quantified recommendations based on data from controlled laboratory and field research. ECMDS is a must-have if you face tough erosion and sediment control regulations. Best of all, it's free of charge, compliments of Tensar. To learn more and access the software directly, go to **www.ECMDS.com**.

INSTRUCTIONS INCLUDED

Proper anchoring patterns and rates must be used to achieve optimal results in RECP installation. View our installation guides for stapling patterns. Site specific staple pattern recommendations based on soil type and severity of application may be acquired through our ECMDS.

HOLD ON TIGHT

When under the pressure of severe conditions, even the best erosion control products can't function to their full potential without proper installation and anchoring. Tensar supplies a wide variety of fastener options for nearly every application and soil type.

For use in cohesive soils, wire staples are a cost-effective means to fasten RECPs. Available in 6 in., 8 in., 10 in. and 12 in. lengths, our U-shaped staples can reach to various depths to ensure adequate pull-out resistance. For installation using our handy Pin Pounder installation tool, 6 in. V-top staples or 6 in. circle top pins are available.

Our biodegradable BioStakes® are available in 4 in. and 6 in. lengths and provide an environmentally friendly alternative to metal staples. For an even more durable, deeper reaching yet all-natural anchoring option, our wood EcoStakes® are available in 6 in., 12 in., 18 in. and 24 in. lengths.

For severe applications needing the ultimate, long-lasting hold, try our 12 and 18 in. rebar staples, our 12 in. plastic ShoreMax® stakes, or our complete line of percussion earth anchors. The Tensar earth anchors reach deep into the soil strata to offer enhanced anchoring in the worst conditions. Our variety of earth anchors are designed for durability and holding power under extreme hydraulic stresses and adverse soil conditions *(Table 1)*.

For more information on the RollMax Systems or other systems within the Tensar Erosion Control Solutions, call **800-TENSAR-1** or visit **www.tensarcorp.com**.

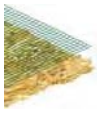
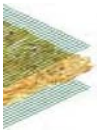
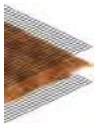
Earth Anchor Options

					EA 400		EA 680	
	Tendon Type (3/32 in. x 36 in.)	**Assembly Description**	**Fast Install**	**Economic Anchor**	**Stainless**	**Galvanized**	**Stainless**	**Galvanized**
End Piece Options with a PVC Face Plate	**Copper Stop Sleeve** with Stainless Steel Washer	Manually crimped to the stainless steel cable to secure the face plate.		X	X		X	
	Grip End Piece with Stainless Steel Washer	Three-dimensional, self-securing metal end piece that does not require manual crimping for tendon tensioning.	X	X	X	X	X	X
	Wedge Grip Piece	Self-securing end piece that installs flush to the face plate. Does not require manual crimping for tendon tensioning.	X		X	X	X	X
	Aluminum Stop Sleeve with Stainless Steel Washer	Manually crimped to the galvanized cable to secure the face plate.		X		X		X

TABLE 1

The complete line of RollMax™ products offers a variety of options for both short-term and permanent erosion control needs. Reference the RollMax Products Chart below to find the right solution for your next project.

RollMax Product Selection Chart

	TEMPORARY						
	ERONET						BIONET
							
	DS75	**DS150**	**S75**	**S150**	**SC150**	**C125**	**S75BN**
Longevity	45 days	60 days	12 mo.	12 mo.	24 mo.	36 mo.	12 mo.
Applications	Low Flow Channels 4:1-3:1 Slopes	Moderate Flow Channels 3:1-2:1 Slopes	Low Flow Channels 4:1-3:1 Slopes	Moderate Flow Channels 3:1-2:1 Slopes	Medium Flow Channels 2:1-1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	Low Flow Channels 4:1-3:1 Slopes
Design Permissible Shear Stress lbs/ft² (Pa)	Unvegetated 1.55 (74)	Unvegetated 1.75 (84)	Unvegetated 1.55 (74)	Unvegetated 1.75 (84)	Unvegetated 2.00 (96)	Unvegetated 2.25 (108)	Unvegetated 1.60 (76)
Design Permissible Velocity ft/s (m/s)	Unvegetated 5.00 (1.52)	Unvegetated 6.00 (1.52)	Unvegetated 5.00 (1.2)	Unvegetated 6.00 (1.83)	Unvegetated 8.00 (2.44)	Unvegetated 10.00 (3.05)	Unvegetated 5.00 (1.52)
Top Net	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft² (4.53 kg/100 m²) approx wt
Center Net	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fiber Matrix	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw/coconut matrix 70% Straw 0.35 lbs/yd² (0.19 kg/m²) 30% Coconut 0.15 lbs/yd² (0.08 kg/m²)	Coconut fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)
Bottom Net	N/A	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	N/A	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	N/A
Thread	Accelerated degradable	Accelerated degradable	Degradable	Degradable	Degradable	UV-stabilized polypropylene	Biodegradable

	TEMPORARY			PERMANENT			
	BIONET			ERONET	VMAX		
	S150BN	**SC150BN**	**C125BN**	**P300**	**SC250**	**C350**	**P550**
Longevity	12 mo.	18 mo.	24 mo.	Permanent	Permanent	Permanent	Permanent
Applications	Moderate Flow Channels 3:1-2:1 Slopes	Medium Flow Channels 2:1-1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	High-Flow Channels 1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	High-Flow Channels 1:1 and Greater Slopes	Extreme High-Flow Channels 1:1 and Greater Slopes
Design Permissible Shear Stress lbs/ft^2 (Pa)	Unvegetated 1.85 (88)	Unvegetated 2.10 (100)	Unvegetated 2.35 (112)	Unvegetated 3.0 (144) Vegetated 8.0 (383)	Unvegetated 3.0 (144) Vegetated 10.0 (480)	Unvegetated 3.2 (153) Vegetated 12.0 (576)	Unvegetated 4.0 (191) Vegetated 14.0 (672)
Design Permissible Velocity ft/s (m/s)	Unvegetated 6.00 (1.83)	Unvegetated 8.00 (2.44)	Unvegetated 10.00 (3.05)	Unvegetated 9.00 (2.7) Vegetated 16.0 (4.9)	Unvegetated 9.5 (2.9) Vegetated 15.0 (4.6)	Unvegetated 10.5 (3.2) Vegetated 20.0 (6.0)	Unvegetated 12.5 (3.8) Vegetated 25.0 (7.6)
Top Net	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Heavyweight polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Extra heavyweight polypropylene 8.0 lbs/1000 ft^2 (3.91 kg/100 m^2) approx wt	Ultra heavyweight polypropylene 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2) approx wt
Center Net	N/A	N/A	N/A	N/A	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)
Fiber Matrix	Straw fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	Straw/coconut matrix 70% Straw 0.35 lbs/yd^2 (0.19 kg/m^2) 30% Coconut 0.15 lbs/yd^2 (0.08 kg/m^2)	Coconut fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	UV-stabilized polypropylene fiber 0.70 lbs/yd^2 (0.38 kg/m^2)	Straw/coconut matrix 70% Straw 0.35 lbs/yd^2 (0.19 kg/m^2) 30% Coconut 0.15 lbs/yd^2 (0.08 kg/m^2)	Coconut fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	UV-stabilized polypropylene fiber 0.50 lbs/yd^2 (0.27 kg/m^2)
Bottom Net	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 3.0 lbs/1000 ft^2 (1.47 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Extra heavyweight polypropylene 8.0 lbs/1000 ft^2 (3.91 kg/100 m^2) approx wt	Ultra heavyweight polypropylene 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2) approx wt
Thread	Biodegradable	Biodegradable	Biodegradable	UV-stabilized polypropylene	UV-stabilized polypropylene	UV-stabilized polypropylene fiber	UV-stabilized polypropylene

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ DS75™ Erosion Control Blanket

DESCRIPTION

The ultra short-term single net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 45 days. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a polypropylene netting having an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographical location and elevation. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The DS75 shall meet Type 1.C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	100% Straw Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Top side only, lightweight photodegradable with photo accelerators	1.5 lb/1000 sq ft (0.73 g/sm)
Thread	Degradable	

Standard Roll Sizes			
Width	6.67 (2.03 m)	8.0 ft (2.4 m)	16 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	40 lbs (18.14 kg)	50 lbs (22.68 kg)	96 lbs (43.54 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.5 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.45 in. (11.43 mm)
Resiliency	ECTC Guidelines	78.8%
Water Absorbency	ASTM D1117	375%
Mass/Unit Area	ASTM 6475	8.57 oz/sy (291 g/sm)
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.31 oz-in
Light Penetration	ASTM D6567	10%
Tensile Strength - MD	ASTM D6818	105.6 lbs/ft (1.57 kN/m)
Elongation - MD	ASTM D6818	34%
Tensile Strength - TD	ASTM D6818	42.0 lbs/ft (0.62 kN/m)
Elongation - TD	ASTM D6818	25.2%
Biomass Improvement	ASTM D7322	286%

Design Permissible Shear Stress	
Unvegetated Shear Stress	1.55 psf (74 Pa)
Unvegetated Velocity	5.00 fps (1.52 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.029	N/A	N/A
20-50 ft	0.11	N/A	N/A
≥ 50 ft (15.2 m)	0.19	N/A	N/A

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.055
0.50 – 2.0 ft	0.055-0.021
≥ 2.0 ft (0.60 m)	0.021

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ROLLMAX™
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Specification Sheet – EroNet™ C125® Erosion Control Blanket

DESCRIPTION

The long-term double net erosion control blanket shall be a machine-produced mat of 100% coconut fiber with a functional longevity of up to 36 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in (1.59 x 1.59 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The C125 shall meet Type 4 specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	100% Coconut Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Heavyweight photodegradable with UV additives	3 lbs/1000 sq ft (1.47 g/sm)
Thread	Black polypropylene	

Standard Roll Sizes		
Width	6.67 (2.03 m)	8 ft (2.44 m)
Length	108 ft (32.92 m)	112 ft (35.14 m)
Weight ± 10%	44 lbs (19.95 kg)	56.25 (25.5 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.22 in. (5.59 mm)
Resiliency	ECTC Guidelines	82%
Water Absorbency	ASTM D1117	167%
Mass/Unit Area	ASTM 6475	7.73 oz/sy (262.8 g/sm)
Swell	ECTC Guidelines	13%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	0.75 oz-in
Light Penetration	ASTM D6567	16.6%
Tensile Strength - MD	ASTM D6818	472.8 lbs/ft (7.01 kN/m)
Elongation - MD	ASTM D6818	25.6%
Tensile Strength - TD	ASTM D6818	225.6 lbs/ft (3.35 kN/m)
Elongation - TD	ASTM D6818	33.9%
Biomass Improvement	ASTM 7322	257%

Design Permissible Shear Stress	
Unvegetated Shear Stress	2.25 psf (108 Pa)
Unvegetated Velocity	10.0 fps (3.05 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.029	0.082
20-50 ft	0.036	0.060	0.096
≥ 50 ft (15.2 m)	0.070	0.090	0.110

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.022
0.50 – 2.0 ft	0.022-0.014
≥ 2.0 ft (0.60 m)	0.014

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ROLLMAX™
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Specification Sheet – VMax® C350® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between super heavy duty UV-stabilized nettings with 0.50 x 0.50 in. (1.27 x 1.27 cm) openings, an ultra heavy duty UV-stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 in. (1.27 x 1.27 cm) openings, and covered by a super heavy duty UV-stabilized nettings with 0.50 x 0.50 in. (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 in. (3.81 cm) centers with UV-stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The C350 shall meet Type 5A, B and C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) *FP-03 Section 713.18*.

Material Content		
Matrix	100% Coconut Fiber	0.5 lb/sy (0.27 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	8 lb/1000 sf (3.91 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	37 lbs (16.8 kg)
Thread	40 sy (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.73 in. (18.54 mm)
Resiliency	ASTM D6524	90%
Density	ASTM D792	0.917 g/cm^3
Mass/Unit Area	ASTM D6566	18.36 oz/sy (624 g/sm)
UV Stability	ASTM D4355/ 1000 HR	86%
Porosity	ECTC Guidelines	99%
Stiffness	ASTM D1388	0.24 in.-lb (275990 mg-cm)
Light Penetration	ASTM D6567	7.2%
Tensile Strength – MD	ASTM D6818	585.8 lbs/ft (8.70 kN/m)
Elongation – MD	ASTM D6818	45.3%
Tensile Strength – TD	ASTM D6818	687.6 lbs/ft (10.20 kN/m)
Elongation – TD	ASTM D6818	19.5%
Biomass Improvement	ASTM D7322	380%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1 Unvegetated	3.2 psf (153 Pa)	3.0 psf (144 Pa)
Phase 2 Partially Veg.	10.0 psf (480 Pa)	10.0 psf (480 Pa)
Phase 3 Fully Veg.	12.0 psf (576 Pa)	10.0 psf (480 Pa)
Unvegetated Velocity	10.5 fps (3.2 m/s)	
Vegetated Velocity	20 fps (6.0 m/s)	

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.0005	0.015	0.043
20-50 ft	0.018	0.031	0.050
≥ 50 ft (15.2 m)	0.035	0.047	0.057

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.041
0.50 – 2.0 ft	0.040-0.013
≥ 2.0 ft (0.60 m)	0.012

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ SC150® Erosion Control Blanket

DESCRIPTION

The extended-term double net erosion control blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 24 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in (1.59 x 1.59 cm) mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The SC150 shall meet Type 3.B specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	70% Straw Fiber 30% Coconut Fiber	0.35 lbs/sq yd (0.19 kg/sm) 0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top: Heavyweight photodegradable with UV additives	3 lbs/1000 sq ft (1.47 kg/100 sm)
	Bottom: lighweight photodegradable	1.5 lb/1000 sq ft (0.73 kg/100 sm)
Thread	Degradable	

Standard Roll Sizes			
Width	6.67 ft (2.03 m)	8 ft (2.4 m)	16.0 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	44 lbs (19.95 kg)	55 lbs (24.95 kg)	105.6 lbs (47.9 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.6 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.35 in. (8.89 mm)
Resiliency	ECTC Guidelines	75%
Water Absorbency	ASTM D1117	342%
Mass/Unit Area	ASTM D6475	7.87 oz/sy (267.6 g/sm)
Swell	ECTC Guidelines	30%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	1.11 oz-in
Light Penetration	ASTM D6567	6.2%
Tensile Strength - MD	ASTM D6818	362.4 lbs/ft (5.37 kN/m)
Elongation - MD	ASTM D6818	29.4%
Tensile Strength - TD	ASTM D6818	136.8 lbs/ft (2.03 kN/m)
Elongation - TD	ASTM D6818	27.6%
Biomass Improvement	ASTM D7322	481%

Design Permissible Shear Stress	
Unvegetated Shear Stress	2.00 psf (96 Pa)
Unvegetated Velocity	8.0 fps (2.44 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.048	0.100
20-50 ft	0.051	0.079	0.145
≥ 50 ft (15.2 m)	0.10	0.110	0.190

NTPEP Large-Scale Slope
ASTM D6459 - C-factor = 0.031

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.050
0.50 – 2.0 ft	0.050-0.018
≥ 2.0 ft (0.60 m)	0.018

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Specification Sheet – VMax® SC250® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 70% straw and 30% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The SC250 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	70% Straw Fiber	0.35 lb/sq yd (0.19 kg/sm)
	30% Coconut Fiber	0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	5 lb/1000 sq ft (2.44 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	34 lbs (15.42 kg)
Area	40 sq yd (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.62 in. (15.75 mm)
Resiliency	ASTM 6524	95.2%
Density	ASTM D792	0.891 g/cm^3
Mass/Unit Area	ASTM 6566	16.13 oz/sy (548 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	99%
Stiffness	ASTM D1388	222.65 oz-in.
Light Penetration	ASTM D6567	4.1%
Tensile Strength – MD	ASTM D6818	709 lbs/ft (10.51 kN/m)
Elongation – MD	ASTM D6818	23.9%
Tensile Strength – TD	ASTM D6818	712 lbs/ft (10.56 kN/m)
Elongation – TD	ASTM D6818	36.9%
Biomass Improvement	ASTM D7322	441%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1: Unvegetated	3.0 psf (144 Pa)	2.5 psf (120 Pa)
Phase 2: Partially Veg.	8.0 psf (383 Pa)	8.0 psf (383 Pa)
Phase 3: Fully Veg.	10.0 psf (480 Pa)	8.0 psf (383 Pa)
Unvegetated Velocity	9.5 fps (2.9 m/s)	
Vegetated Velocity	15 fps (4.6 m/s)	

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.0010	0.0209	0.0507
20-50 ft	0.0081	0.0266	0.0574
≥ 50 ft (15.2 m)	0.0455	0.0555	0.081

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.040
0.50 – 2.0 ft	0.040-0.012
≥ 2.0 ft (0.60 m)	0.011

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – VMax® P550® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% UV stable polypropylene fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The P550 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	100% UV stable polypropylene fiber	0.5 lb/sy (0.27 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	52 lbs (23.59 kg)
Area	40 sy (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.72 in. (18.29 mm)
Resiliency	ASTM 6524	95%
Density	ASTM D792	0.892 g/cm^3
Mass/Unit Area	ASTM 6566	21.25 oz/sy (723 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	96%
Stiffness	ASTM D1388	366.3 oz-in.
Light Penetration	ASTM D6567	16.5%
Tensile Strength – MD	ASTM D6818	1421 lbs/ft (21.07 kN/m)
Elongation – MD	ASTM D6818	40.5%
Tensile Strength – TD	ASTM D6818	1191.6 lbs/ft (17.67 kN/m)
Elongation – TD	ASTM D6818	28.8%
Biomass Improvement	ASTM D7322	378%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1: Unvegetated	4.0 psf (191 Pa)	3.25 psf (156 Pa)
Phase 2: Partially Veg.	12.0 psf (576 Pa)	12.0 psf (576 Pa)
Phase 3: Fully Veg.	14.0 psf (672 Pa)	12.0 psf (576 Pa)
Unvegetated Velocity	12.5 fps (3.8 m/s)	
Vegetated Velocity	25 fps (7.6 m/s)	

NTPEP ASTM D6460 Large Scale Channel	
Vegetated Shear Stress	>13.2 psf (632 Pa)
Vegetated Velocity	>24.5 fps (7.47 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.0005	0.015	0.043
20-50 ft	0.0173	0.031	0.050
≥ 50 ft (15.2 m)	0.035	0.047	0.057

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.041
0.50 – 2.0 ft	0.040-0.013
≥ 2.0 ft (0.60 m)	0.013

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – VMax® W3000™ High-Performance Turf Reinforcement Mat

DESCRIPTION

The VMax® W3000™ high performance turf reinforcement mat (HPTRM) is a machine-produced mat of 100% UV-stabilized high denier poly yarns woven into permanent, high strength three-dimensional turf reinforcement matting. The mat consists of a woven bottom layer integrally interlaced into a woven corrugated middle layer, with poly tendons on the top side spanning the entire machine direction. The mat is designed to provide sufficient thickness, optimum open area and three-dimensionality for effective erosion control and vegetation reinforcement against high flow induced shear forces. The mat has high tensile strength providing excellent damage resistance and increased bearing capacity of vegetated soils subject to heavy loads from maintenance equipment and other vehicular traffic. The corrugated structure provides a highly frictional surface to prevent sod slippage when sod is installed over the mat. When used as surface protection without sod overlay, the corrugated structure encapsulates the seed and soil in place while promoting self-soil infilling of the system.

Material Content		
Bottom	100% UV stable poly fiber weave	Black/Green
Corrugated Middle	100% UV stable poly fiber weave	Black/Green
Top	100% UV stable Poly Tendons	Green

Standard Roll Sizes	
Width	10 ft (3.05 m)
Length	90 ft (27.4 m)
Weight ± 10%	90 lbs (41.0 kg)
Area	100 sy (83.6 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.40 in. (10.2 mm)
Resiliency	ASTM D6524	98%
Mass/Unit Area	ASTM 6566	14.7oz/sy (495 g/m2)
Tensile Strength - MD	ASTM D6818	3600 lbs/ft (52.6 kN/m)
Elongation - MD	ASTM D6818	35%*
Tensile Strength - TD	ASTM D6818	3800 lbs/ft (55.5 kN/m)
Elongation - TD	ASTM D6818	20%*
Light Penetration	ASTM D6567	12%
UV Stability	ASTM D4355	>80% @3000 hrs

** Measured on fabric prior to corrugation for true measurement of base fabric elongation*

Design Permissible Shear Stress*	
Vegetated Shear Stress	16 psf (766 Pa)
Vegetated Velocity	25 fps (7.6 m/s)

**Values extrapolated through ASTM D6460 testing*

ASTM D6460 Large Scale Channel	
Vegetated Shear Stress	>13.2 psf (632 Pa)
Vegetated Velocity	>24.5 fps (7.47 m/s)

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ATTACHMENT 4.3
OUTLET BASIN OUTLET BASIN DESIGN WORKSHEETS

LEIDY SOUTH PROJECT

COMPRESSOR STATION 607

OUTLET BASIN DESIGN FOR SED BASIN/WET POND OUTLET

PIPE DIAMETER, D (IN)	FLOW, Q (CFS)	OUTLET BASIN WIDTH, W (FT)	OUTLET BASIN LENGTH, L (FT)	OUTLET BASIN DEPTH (FT)	RIPRAP ROCK SIZE	ROCK THICKNESS (IN)	VELOCITY CHECK (FPS)
15	0.05	3	18.00	1.00	R-3	9	0.86

Weir Flow Equation Used for finding head above crest:

Q=C*L*H^1.5

where Q= flow (cfs)

C= weir coefficient (3.0)

L= Crest Length (ft)

H= Head above crest (ft)

Velocity over weir, v (in fps) = sqrt (2gH), where g= 32.17 fps

From E&S Manual,

Outlet Basin Length = 6x pipe Diameter

Desirable velocity for downslope grass cover = 2.5 fps

LEIDY SOUTH PROJECT
COMPRESSOR STATION 607
OUTLET BASIN DESIGN FOR INFILTRATION BASIN

PIPE DIAMETER, D (IN)	FLOW, Q (CFS)	OUTLET BASIN WIDTH, W (FT)	OUTLET BASIN LENGTH, L (FT)	OUTLET BASIN DEPTH (FT)	RIPRAP ROCK SIZE	ROCK THICKNESS (IN)	VELOCITY CHECK (FPS)
18	1.25	16.00	96.00	1.00	R-3	9	2.47

Weir Flow Equation Used for finding head above crest:

Q=C*L*H^1.5

where Q= flow (cfs)

C= weir coefficient (3.0)

L= Crest Length (ft)

H= Head above crest (ft)

Velocity over weir, v (in fps) = sqrt (2gH), where g= 32.17 fps

From E&S Manual,

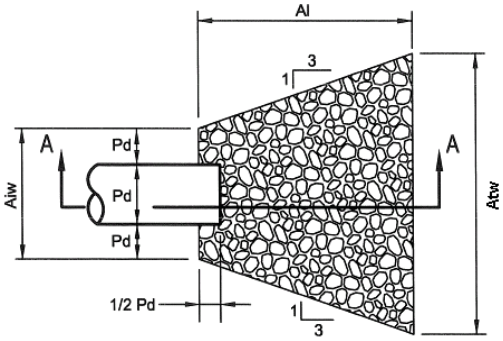
Outlet Basin Length = 6x pipe Diameter

Desirable velocity for downslope grass cover = 2.5 fps

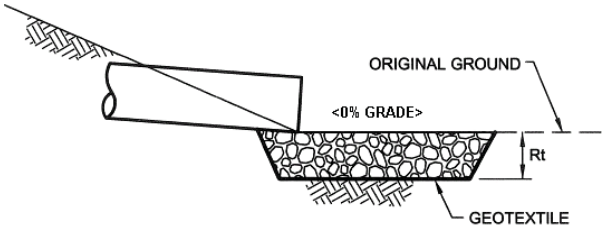
ATTACHMENT 4.4
RIPRAP APRON DESIGN WORKSHEET

STANDARD E&S WORKSHEET # 20
Riprap Apron Outlet Protection

PROJECT NAME: Leidy South – Compressor Station 607
LOCATION: Hensel Replacement – Compressor Station 607
PREPARED BY: FPV DATE: 05/20/2020
CHECKED BY: KCC DATE: 05/20/2020



PLAN VIEW

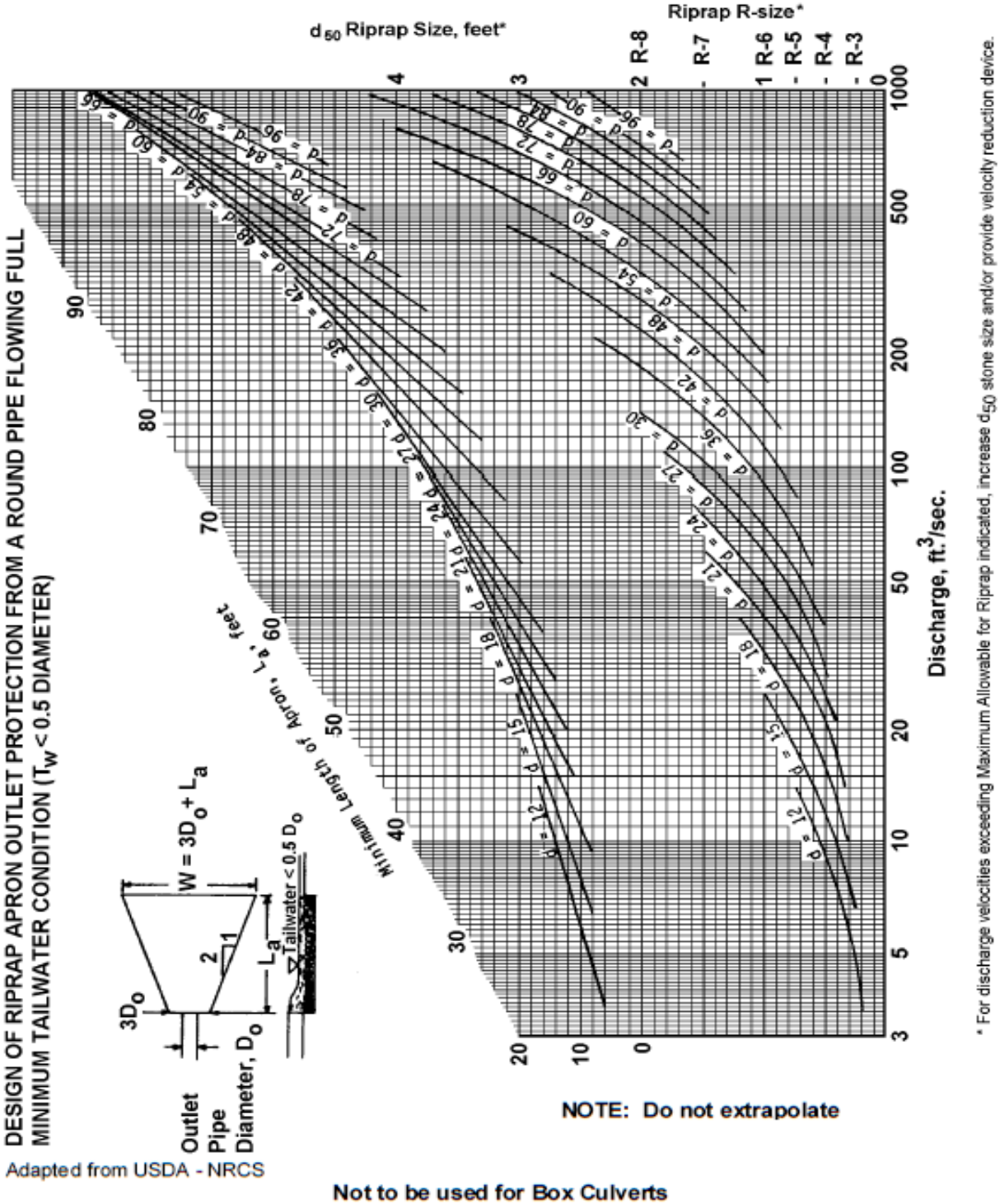


SECTION A - A

OUTLET ID	PIPE/ CHANNEL DIA. Do (in.)	TAIL WATER COND. (Max or Min)	MAN. "n" FOR PIPE	PIPE/ CHANNEL SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
R-1	24	Min	0.013	0.013	10.05	3.20	R-4	14	14	6	20
R-2	24	Min	0.012	0.011	5.39	5.94	R-3	9	10	6	19
R-3	24	Min	0.042	0.033	8.58	3.5	R-4	14	14	6	20
R-4	24	Min	0.059	0.025	1.38	0.44	R-4	14	14	6	20
R-5	24	Min	0.012	0.011	5.34	5.90	R-3	9	10	6	19
R-6	24	Min	0.012	0.011	5.31	5.90	R-3	9	10	6	19

***:The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning's equation to calculate velocity for pipe slopes ≥ 0.05 ft/ft.**

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

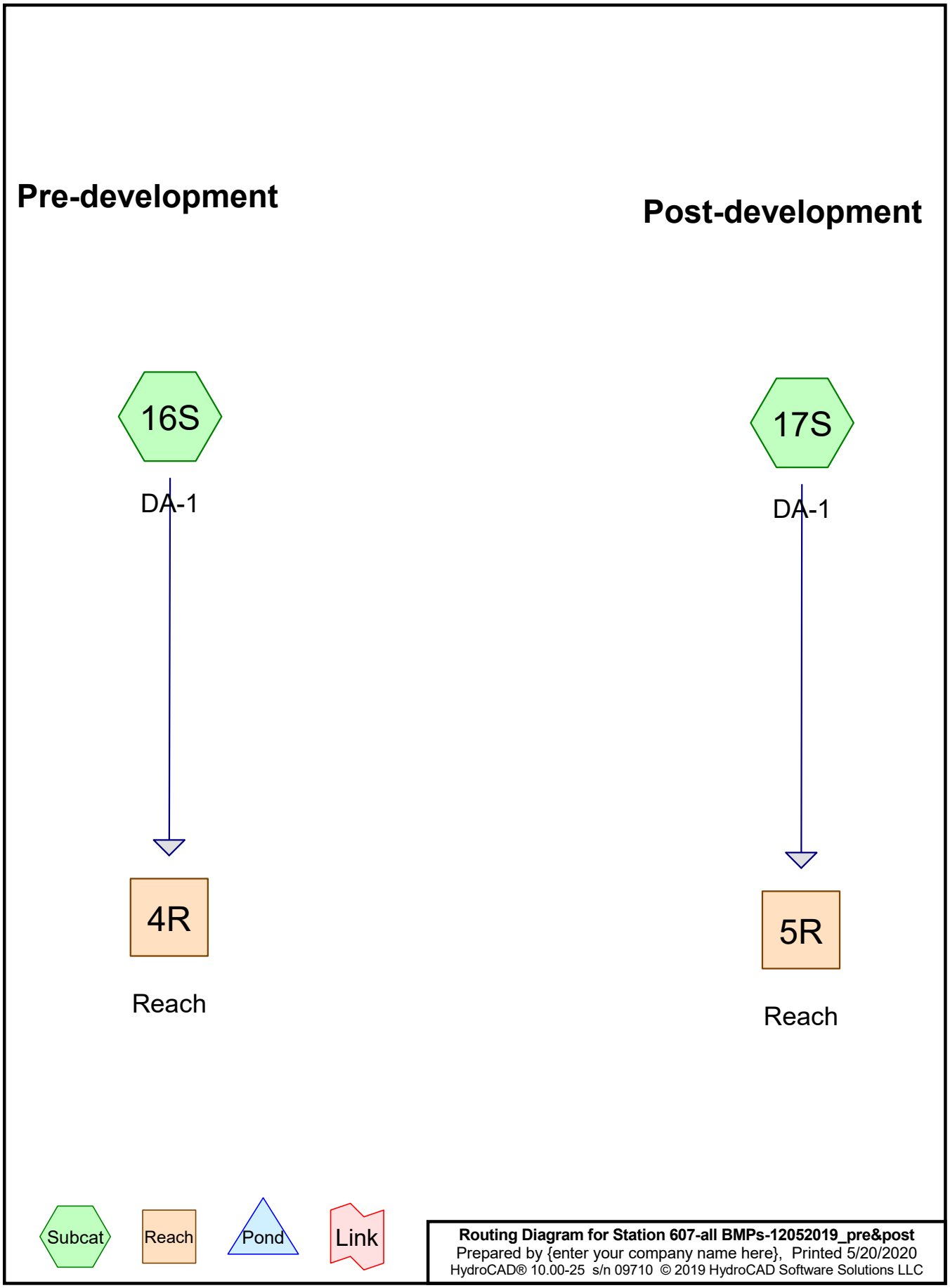
Not to be used for Box Culverts

ATTACHMENT 4.5
CULVERT SCHEDULE

Compressor Station 607 Culvert Schedule

I.D.	Drainage Area [ac]	Req'd Flow [cfs]	Length (ft)	Slope [ft/ft]	No. of Pipes	Pipe Diameter [in]
CULVERT #1	1.75	10.05	63.0	0.013	1	24

ATTACHMENT 4.6
HYDROCAD REPORT


Pre-development
Post-development
16S
DA-1
4R
Reach
17S
DA-1
5R
Reach
Subcat
Reach
Pond
Link
Routing Diagram for Station 607-all BMPs-12052019_pre&post
Prepared by {enter your company name here}, Printed 5/20/2020
HydroCAD® 10.00-25 s/n 09710 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
228,429	89	Gravel roads, HSG C (16S, 17S)
25,047	91	Gravel roads, HSG D (16S, 17S)
859,657	71	Meadow, non-grazed, HSG C (16S, 17S)
387,118	78	Meadow, non-grazed, HSG D (16S, 17S)
178,770	73	Woods, Fair, HSG C (16S, 17S)
39,945	79	Woods, Fair, HSG D (16S, 17S)
1,718,965	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
1,266,855	HSG C	16S, 17S
452,109	HSG D	16S, 17S
0	Other	
1,718,965		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcat Numbe
0	0	228,429	25,047	0	253,476	Gravel roads	
0	0	859,657	387,118	0	1,246,774	Meadow, non-grazed	
0	0	178,770	39,945	0	218,715	Woods, Fair	
0	**0**	**1,266,855**	**452,109**	**0**	**1,718,965**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	17S	0.00	0.00	125.0	0.0230	0.013	18.0	0.0	0.0
2	17S	0.00	0.00	40.0	0.0100	0.013	18.0	0.0	0.0

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 16S: DA-1 Runoff Area=19.812 ac 0.00% Impervious Runoff Depth>0.49"
Flow Length=1,699' Tc=36.8 min CN=74 Runoff=6.92 cfs 35,002 cf

Subcatchment 17S: DA-1 Runoff Area=19.650 ac 0.00% Impervious Runoff Depth>0.65"
Flow Length=1,829' Tc=31.8 min CN=78 Runoff=10.90 cfs 46,247 cf

Reach 4R: Reach Inflow=6.92 cfs 35,002 cf
Outflow=6.92 cfs 35,002 cf

Reach 5R: Reach Inflow=10.90 cfs 46,247 cf
Outflow=10.90 cfs 46,247 cf

Total Runoff Area = 1,718,965 sf Runoff Volume = 81,249 cf Average Runoff Depth = 0.57"
100.00% Pervious = 1,718,965 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 16S: DA-1

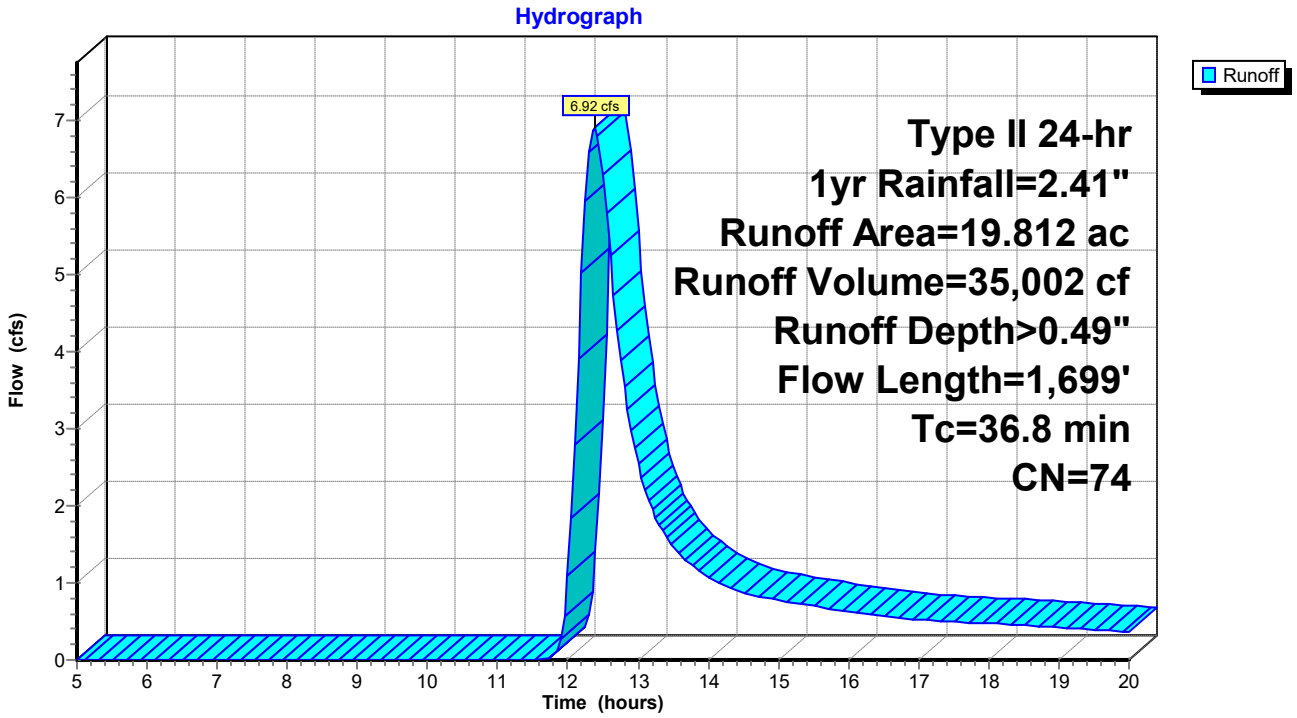
Runoff = 6.92 cfs @ 12.38 hrs, Volume= 35,002 cf, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.41"

	Area (ac)	CN	Description
	2.719	73	Woods, Fair, HSG C
	0.707	79	Woods, Fair, HSG D
	4.572	78	Meadow, non-grazed, HSG D
*	11.340	71	Meadow, non-grazed, HSG C
	0.262	89	Gravel roads, HSG C
	0.212	91	Gravel roads, HSG D
	19.812	74	Weighted Average
	19.812		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	78	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
3.6	178	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	625	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0170	2.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
36.8	1,699	Total			

Subcatchment 16S: DA-1



Hydrograph for Subcatchment 16S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.15	0.00	0.00
5.25	0.16	0.00	0.00
5.50	0.17	0.00	0.00
5.75	0.18	0.00	0.00
6.00	0.19	0.00	0.00
6.25	0.20	0.00	0.00
6.50	0.22	0.00	0.00
6.75	0.23	0.00	0.00
7.00	0.24	0.00	0.00
7.25	0.25	0.00	0.00
7.50	0.26	0.00	0.00
7.75	0.28	0.00	0.00
8.00	0.29	0.00	0.00
8.25	0.30	0.00	0.00
8.50	0.32	0.00	0.00
8.75	0.34	0.00	0.00
9.00	0.35	0.00	0.00
9.25	0.37	0.00	0.00
9.50	0.39	0.00	0.00
9.75	0.41	0.00	0.00
10.00	0.44	0.00	0.00
10.25	0.46	0.00	0.00
10.50	0.49	0.00	0.00
10.75	0.53	0.00	0.00
11.00	0.57	0.00	0.00
11.25	0.62	0.00	0.00
11.50	0.68	0.00	0.00
11.75	0.93	0.01	0.02
12.00	1.60	0.18	1.08
12.25	1.70	0.22	**5.95**
12.50	1.77	0.25	**6.30**
12.75	1.82	0.27	3.89
13.00	1.86	0.29	2.55
13.25	1.90	0.30	1.85
13.50	1.93	0.32	1.47
13.75	1.95	0.33	1.25
14.00	1.98	0.34	1.08
14.25	2.00	0.35	0.96
14.50	2.02	0.36	0.87
14.75	2.04	0.37	0.81
15.00	2.06	0.38	0.77
15.25	2.07	0.39	0.74
15.50	2.09	0.39	0.70
15.75	2.11	0.40	0.67
16.00	2.12	0.41	0.63
16.25	2.13	0.41	0.59
16.50	2.15	0.42	0.56
16.75	2.16	0.43	0.54
17.00	2.17	0.43	0.53
17.25	2.19	0.44	0.51
17.50	2.20	0.45	0.50
17.75	2.21	0.45	0.49
18.00	2.22	0.46	0.47
18.25	2.23	0.46	0.46
18.50	2.24	0.47	0.45
18.75	2.25	0.47	0.43
19.00	2.26	0.48	0.42
19.25	2.27	0.48	0.41
19.50	2.28	0.49	0.39
19.75	2.29	0.49	0.38
20.00	**2.29**	**0.50**	0.36

Summary for Subcatchment 17S: DA-1

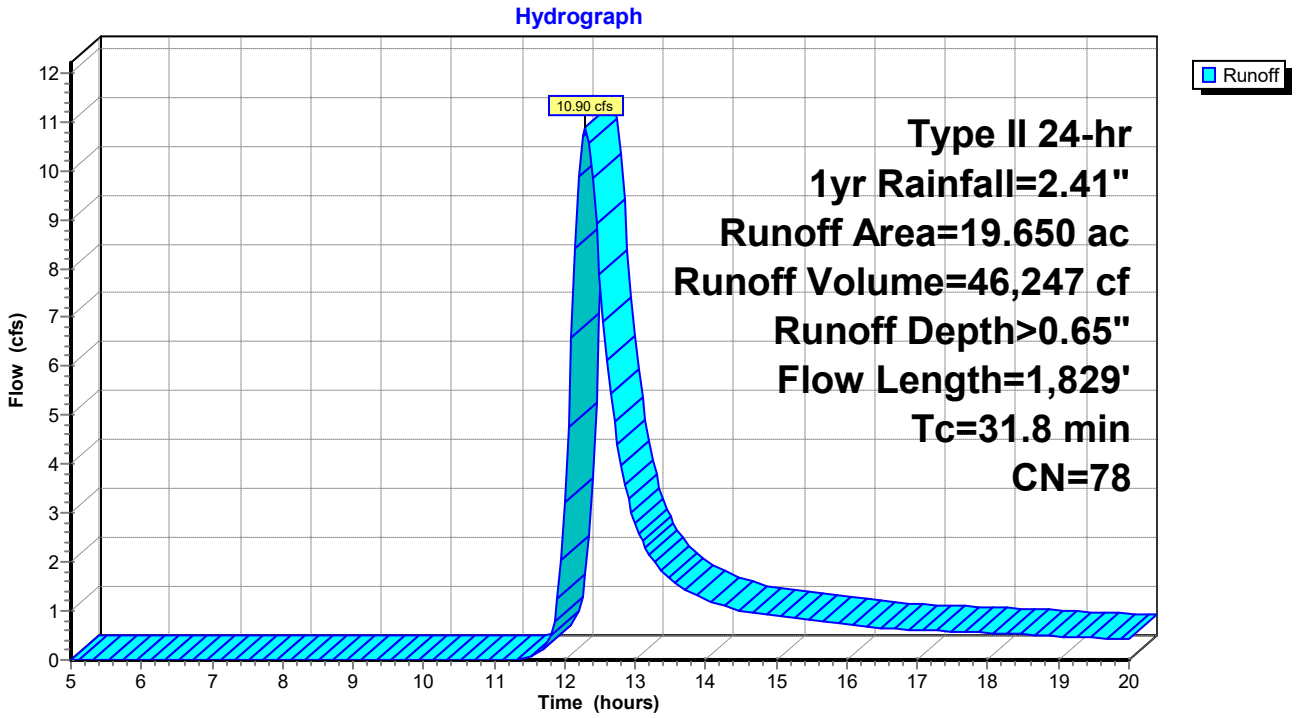
Runoff = 10.90 cfs @ 12.29 hrs, Volume= 46,247 cf, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.41"

Area (ac)	CN	Description
1.385	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.395	71	Meadow, non-grazed, HSG C
4.315	78	Meadow, non-grazed, HSG D
4.982	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
19.650	78	Weighted Average
19.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	90	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
5.6	309	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	282	0.0410	2.12	2.12	**Channel Flow, #6** Area= 1.0 sf Perim= 4.5' r= 0.22' n= 0.052
0.2	125	0.0230	9.01	15.93	**Pipe Channel, Culvert #8** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
1.9	245	0.0200	2.14	4.92	**Channel Flow, #4** Area= 2.3 sf Perim= 5.8' r= 0.40' n= 0.053
0.1	40	0.0100	5.94	10.50	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
31.8	1,829	Total			

Subcatchment 17S: DA-1



Hydrograph for Subcatchment 17S: DA-1

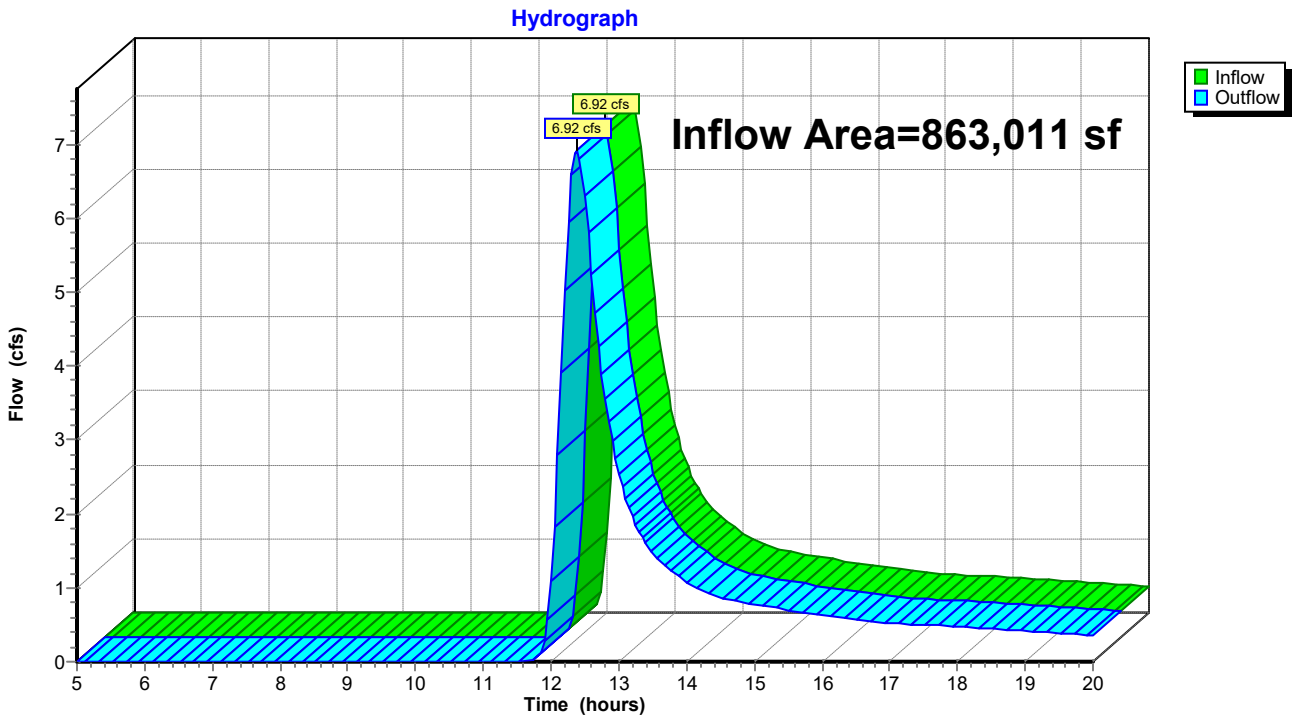
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.15	0.00	0.00
5.25	0.16	0.00	0.00
5.50	0.17	0.00	0.00
5.75	0.18	0.00	0.00
6.00	0.19	0.00	0.00
6.25	0.20	0.00	0.00
6.50	0.22	0.00	0.00
6.75	0.23	0.00	0.00
7.00	0.24	0.00	0.00
7.25	0.25	0.00	0.00
7.50	0.26	0.00	0.00
7.75	0.28	0.00	0.00
8.00	0.29	0.00	0.00
8.25	0.30	0.00	0.00
8.50	0.32	0.00	0.00
8.75	0.34	0.00	0.00
9.00	0.35	0.00	0.00
9.25	0.37	0.00	0.00
9.50	0.39	0.00	0.00
9.75	0.41	0.00	0.00
10.00	0.44	0.00	0.00
10.25	0.46	0.00	0.00
10.50	0.49	0.00	0.00
10.75	0.53	0.00	0.00
11.00	0.57	0.00	0.00
11.25	0.62	0.00	0.00
11.50	0.68	0.00	0.06
11.75	0.93	0.04	0.32
12.00	1.60	0.28	3.21
12.25	1.70	0.33	**10.71**
12.50	1.77	0.36	**7.88**
12.75	1.82	0.39	4.39
13.00	1.86	0.41	2.78
13.25	1.90	0.43	2.05
13.50	1.93	0.44	1.65
13.75	1.95	0.46	1.40
14.00	1.98	0.47	1.24
14.25	2.00	0.48	1.11
14.50	2.02	0.49	1.01
14.75	2.04	0.51	0.95
15.00	2.06	0.52	0.90
15.25	2.07	0.53	0.86
15.50	2.09	0.54	0.82
15.75	2.11	0.55	0.77
16.00	2.12	0.55	0.73
16.25	2.13	0.56	0.69
16.50	2.15	0.57	0.65
16.75	2.16	0.58	0.63
17.00	2.17	0.58	0.61
17.25	2.19	0.59	0.60
17.50	2.20	0.60	0.58
17.75	2.21	0.61	0.57
18.00	2.22	0.61	0.55
18.25	2.23	0.62	0.53
18.50	2.24	0.62	0.52
18.75	2.25	0.63	0.50
19.00	2.26	0.64	0.48
19.25	2.27	0.64	0.47
19.50	2.28	0.65	0.45
19.75	2.29	0.65	0.43
20.00	**2.29**	**0.66**	0.42

Summary for Reach 4R: Reach

Inflow Area = 863,011 sf, 0.00% Impervious, Inflow Depth > 0.49" for 1yr event
Inflow = 6.92 cfs @ 12.38 hrs, Volume= 35,002 cf
Outflow = 6.92 cfs @ 12.38 hrs, Volume= 35,002 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 4R: Reach



Hydrograph for Reach 4R: Reach

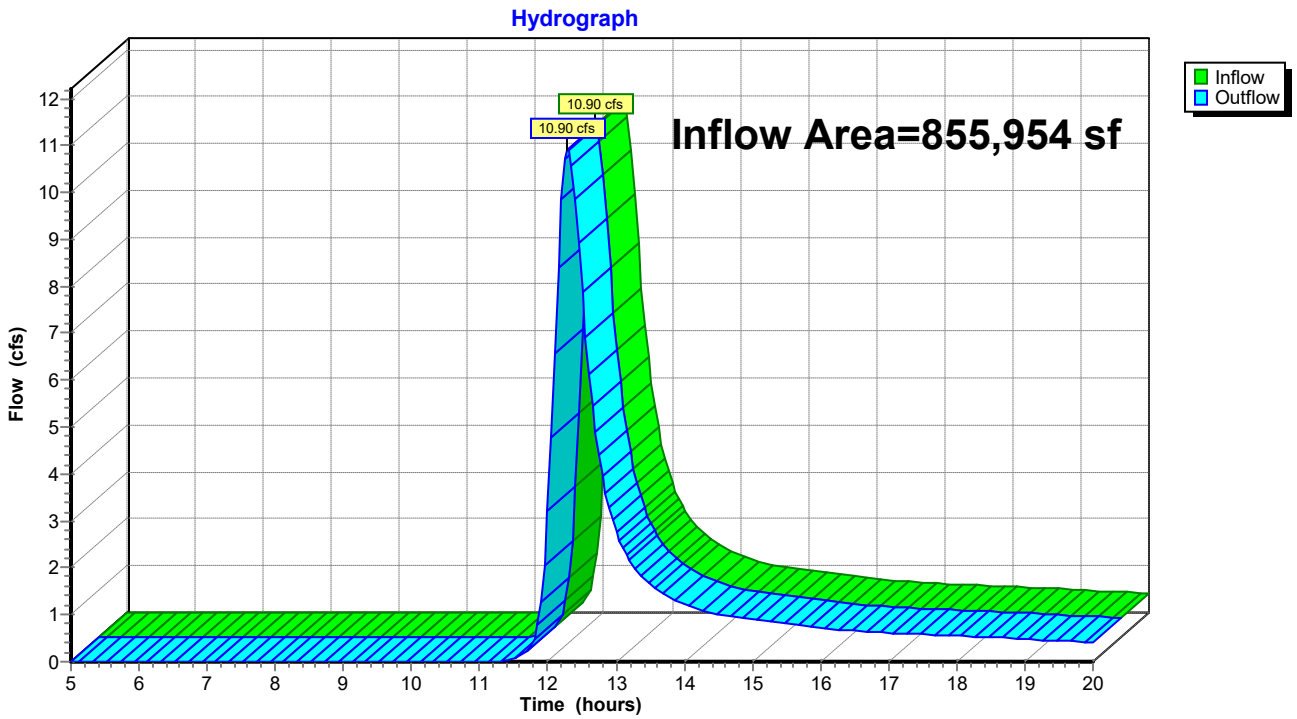
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	0.49		0.49
5.25	0.00		0.00	18.00	0.47		0.47
5.50	0.00		0.00	18.25	0.46		0.46
5.75	0.00		0.00	18.50	0.45		0.45
6.00	0.00		0.00	18.75	0.43		0.43
6.25	0.00		0.00	19.00	0.42		0.42
6.50	0.00		0.00	19.25	0.41		0.41
6.75	0.00		0.00	19.50	0.39		0.39
7.00	0.00		0.00	19.75	0.38		0.38
7.25	0.00		0.00	20.00	0.36		0.36
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.00		0.00				
11.75	0.02		0.02				
12.00	1.08		1.08				
12.25	**5.95**		**5.95**				
12.50	**6.30**		**6.30**				
12.75	3.89		3.89				
13.00	2.55		2.55				
13.25	1.85		1.85				
13.50	1.47		1.47				
13.75	1.25		1.25				
14.00	1.08		1.08				
14.25	0.96		0.96				
14.50	0.87		0.87				
14.75	0.81		0.81				
15.00	0.77		0.77				
15.25	0.74		0.74				
15.50	0.70		0.70				
15.75	0.67		0.67				
16.00	0.63		0.63				
16.25	0.59		0.59				
16.50	0.56		0.56				
16.75	0.54		0.54				
17.00	0.53		0.53				
17.25	0.51		0.51				
17.50	0.50		0.50				

Summary for Reach 5R: Reach

Inflow Area = 855,954 sf, 0.00% Impervious, Inflow Depth > 0.65" for 1yr event
Inflow = 10.90 cfs @ 12.29 hrs, Volume= 46,247 cf
Outflow = 10.90 cfs @ 12.29 hrs, Volume= 46,247 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Reach



Hydrograph for Reach 5R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	0.57		0.57
5.25	0.00		0.00	18.00	0.55		0.55
5.50	0.00		0.00	18.25	0.53		0.53
5.75	0.00		0.00	18.50	0.52		0.52
6.00	0.00		0.00	18.75	0.50		0.50
6.25	0.00		0.00	19.00	0.48		0.48
6.50	0.00		0.00	19.25	0.47		0.47
6.75	0.00		0.00	19.50	0.45		0.45
7.00	0.00		0.00	19.75	0.43		0.43
7.25	0.00		0.00	20.00	0.42		0.42
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.00		0.00				
11.00	0.00		0.00				
11.25	0.00		0.00				
11.50	0.06		0.06				
11.75	0.32		0.32				
12.00	3.21		3.21				
12.25	**10.71**		**10.71**				
12.50	**7.88**		**7.88**				
12.75	4.39		4.39				
13.00	2.78		2.78				
13.25	2.05		2.05				
13.50	1.65		1.65				
13.75	1.40		1.40				
14.00	1.24		1.24				
14.25	1.11		1.11				
14.50	1.01		1.01				
14.75	0.95		0.95				
15.00	0.90		0.90				
15.25	0.86		0.86				
15.50	0.82		0.82				
15.75	0.77		0.77				
16.00	0.73		0.73				
16.25	0.69		0.69				
16.50	0.65		0.65				
16.75	0.63		0.63				
17.00	0.61		0.61				
17.25	0.60		0.60				
17.50	0.58		0.58				

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 16S: DA-1 Runoff Area=19.812 ac 0.00% Impervious Runoff Depth>0.74"
Flow Length=1,699' Tc=36.8 min CN=74 Runoff=11.16 cfs 52,920 cf

Subcatchment 17S: DA-1 Runoff Area=19.650 ac 0.00% Impervious Runoff Depth>0.94"
Flow Length=1,829' Tc=31.8 min CN=78 Runoff=16.24 cfs 66,782 cf

Reach 4R: Reach Inflow=11.16 cfs 52,920 cf
Outflow=11.16 cfs 52,920 cf

Reach 5R: Reach Inflow=16.24 cfs 66,782 cf
Outflow=16.24 cfs 66,782 cf

Total Runoff Area = 1,718,965 sf Runoff Volume = 119,701 cf Average Runoff Depth = 0.84"
100.00% Pervious = 1,718,965 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 16S: DA-1

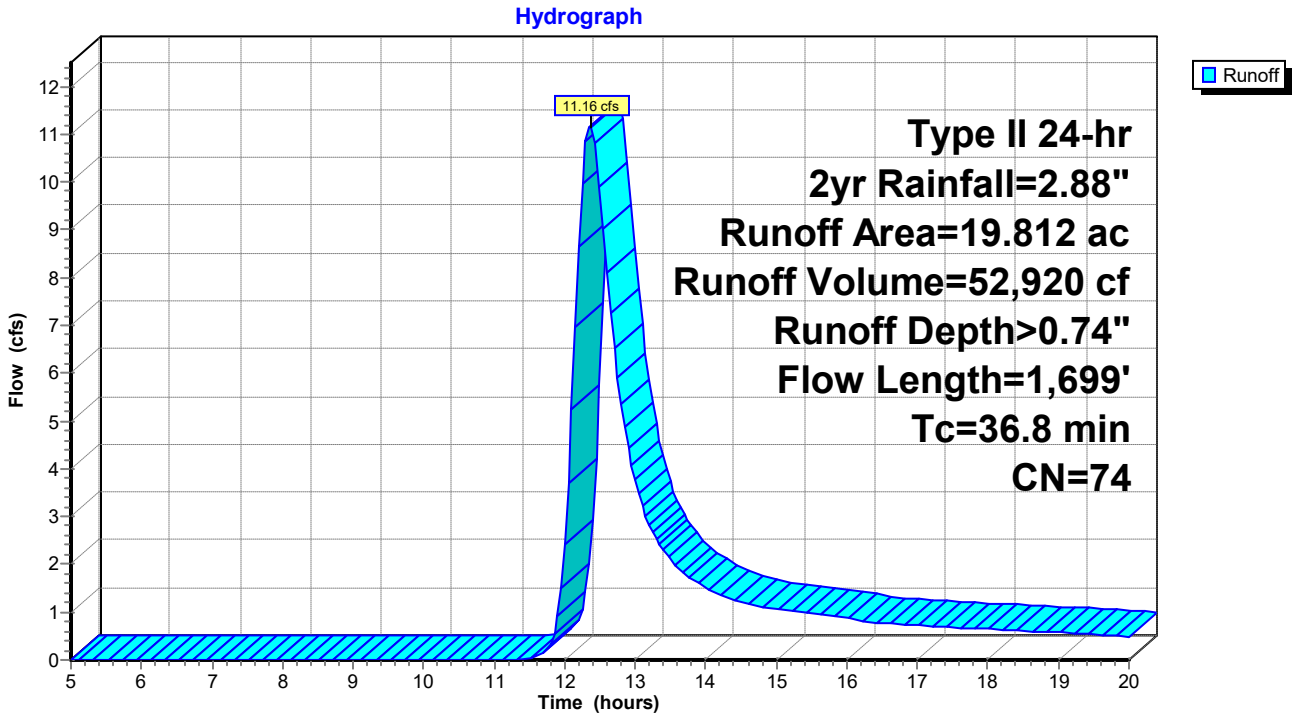
Runoff = 11.16 cfs @ 12.36 hrs, Volume= 52,920 cf, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.88"

	Area (ac)	CN	Description
	2.719	73	Woods, Fair, HSG C
	0.707	79	Woods, Fair, HSG D
	4.572	78	Meadow, non-grazed, HSG D
*	11.340	71	Meadow, non-grazed, HSG C
	0.262	89	Gravel roads, HSG C
	0.212	91	Gravel roads, HSG D
	19.812	74	Weighted Average
	19.812		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	78	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
3.6	178	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	625	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0170	2.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
36.8	1,699	Total			

Subcatchment 16S: DA-1



Hydrograph for Subcatchment 16S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.18	0.00	0.00
5.25	0.19	0.00	0.00
5.50	0.21	0.00	0.00
5.75	0.22	0.00	0.00
6.00	0.23	0.00	0.00
6.25	0.24	0.00	0.00
6.50	0.26	0.00	0.00
6.75	0.27	0.00	0.00
7.00	0.29	0.00	0.00
7.25	0.30	0.00	0.00
7.50	0.31	0.00	0.00
7.75	0.33	0.00	0.00
8.00	0.35	0.00	0.00
8.25	0.36	0.00	0.00
8.50	0.38	0.00	0.00
8.75	0.40	0.00	0.00
9.00	0.42	0.00	0.00
9.25	0.45	0.00	0.00
9.50	0.47	0.00	0.00
9.75	0.49	0.00	0.00
10.00	0.52	0.00	0.00
10.25	0.55	0.00	0.00
10.50	0.59	0.00	0.00
10.75	0.63	0.00	0.00
11.00	0.68	0.00	0.00
11.25	0.74	0.00	0.00
11.50	0.82	0.00	0.02
11.75	1.11	0.04	0.20
12.00	1.91	0.31	2.41
12.25	2.03	0.37	**9.99**
12.50	2.12	0.41	**9.89**
12.75	2.17	0.43	5.89
13.00	2.22	0.46	3.76
13.25	2.26	0.48	2.68
13.50	2.30	0.50	2.10
13.75	2.33	0.52	1.76
14.00	2.36	0.53	1.51
14.25	2.39	0.55	1.34
14.50	2.41	0.56	1.22
14.75	2.44	0.57	1.13
15.00	2.46	0.58	1.07
15.25	2.48	0.60	1.02
15.50	2.50	0.61	0.97
15.75	2.52	0.62	0.92
16.00	2.53	0.63	0.87
16.25	2.55	0.64	0.82
16.50	2.57	0.65	0.78
16.75	2.58	0.65	0.75
17.00	2.60	0.66	0.72
17.25	2.61	0.67	0.70
17.50	2.63	0.68	0.69
17.75	2.64	0.69	0.67
18.00	2.65	0.70	0.65
18.25	2.67	0.70	0.63
18.50	2.68	0.71	0.61
18.75	2.69	0.72	0.59
19.00	2.70	0.72	0.57
19.25	2.71	0.73	0.55
19.50	2.72	0.74	0.53
19.75	2.73	0.74	0.51
20.00	**2.74**	**0.75**	0.49

Summary for Subcatchment 17S: DA-1

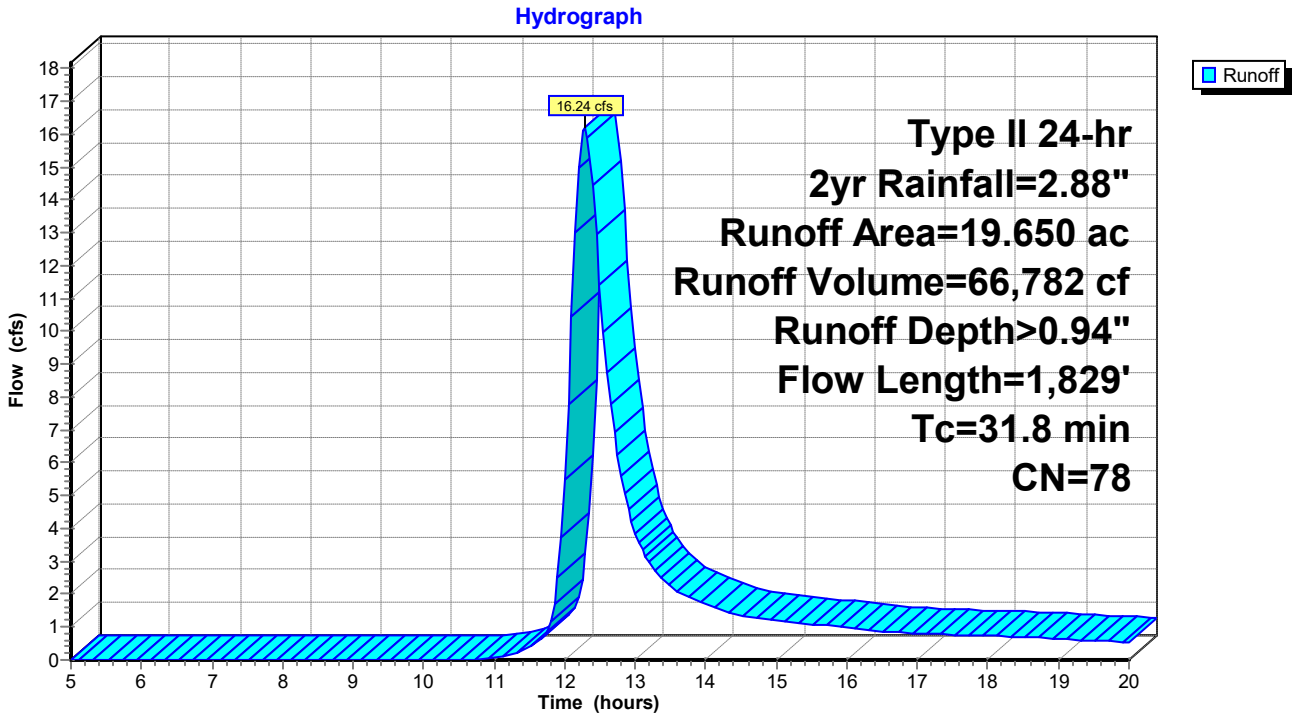
Runoff = 16.24 cfs @ 12.28 hrs, Volume= 66,782 cf, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.88"

Area (ac)	CN	Description
1.385	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.395	71	Meadow, non-grazed, HSG C
4.315	78	Meadow, non-grazed, HSG D
4.982	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
19.650	78	Weighted Average
19.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	90	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
5.6	309	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	282	0.0410	2.12	2.12	**Channel Flow, #6** Area= 1.0 sf Perim= 4.5' r= 0.22' n= 0.052
0.2	125	0.0230	9.01	15.93	**Pipe Channel, Culvert #8** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
1.9	245	0.0200	2.14	4.92	**Channel Flow, #4** Area= 2.3 sf Perim= 5.8' r= 0.40' n= 0.053
0.1	40	0.0100	5.94	10.50	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
31.8	1,829	Total			

Subcatchment 17S: DA-1



Hydrograph for Subcatchment 17S: DA-1

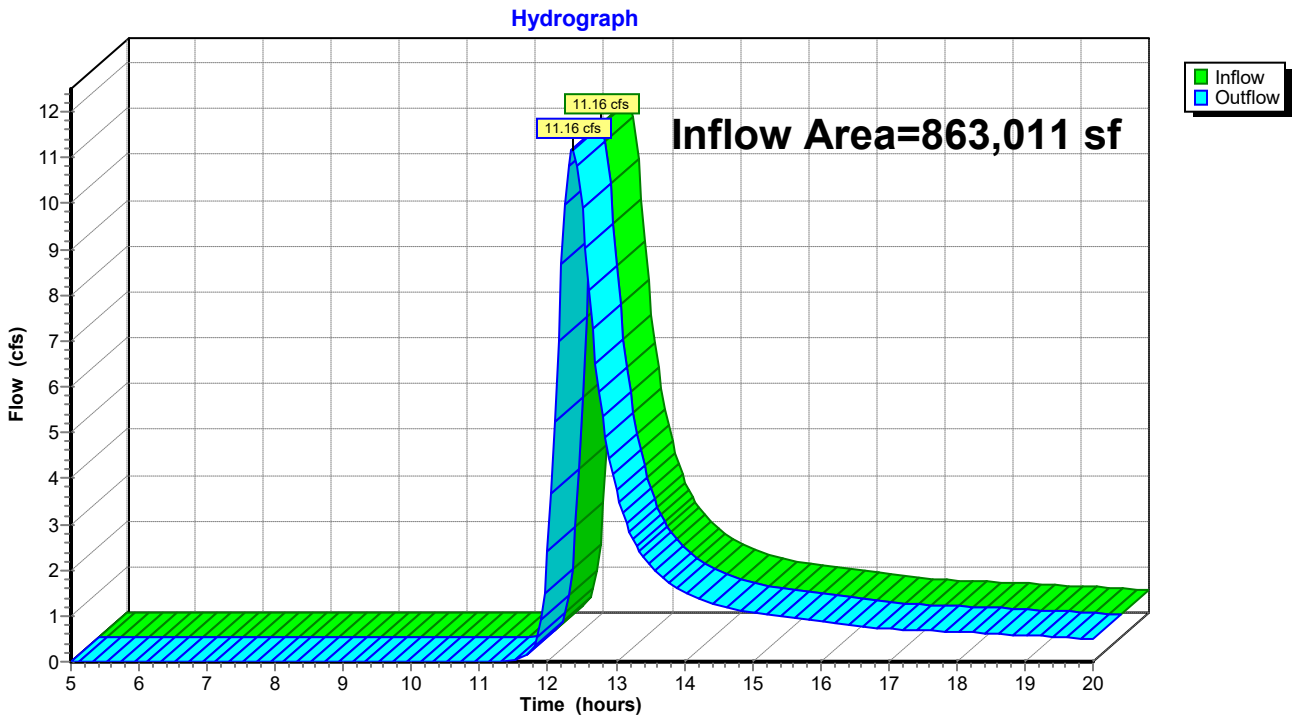
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.18	0.00	0.00
5.25	0.19	0.00	0.00
5.50	0.21	0.00	0.00
5.75	0.22	0.00	0.00
6.00	0.23	0.00	0.00
6.25	0.24	0.00	0.00
6.50	0.26	0.00	0.00
6.75	0.27	0.00	0.00
7.00	0.29	0.00	0.00
7.25	0.30	0.00	0.00
7.50	0.31	0.00	0.00
7.75	0.33	0.00	0.00
8.00	0.35	0.00	0.00
8.25	0.36	0.00	0.00
8.50	0.38	0.00	0.00
8.75	0.40	0.00	0.00
9.00	0.42	0.00	0.00
9.25	0.45	0.00	0.00
9.50	0.47	0.00	0.00
9.75	0.49	0.00	0.00
10.00	0.52	0.00	0.00
10.25	0.55	0.00	0.00
10.50	0.59	0.00	0.00
10.75	0.63	0.00	0.02
11.00	0.68	0.00	0.07
11.25	0.74	0.01	0.18
11.50	0.82	0.02	0.37
11.75	1.11	0.09	0.87
12.00	1.91	0.43	5.49
12.25	2.03	0.50	**16.08**
12.50	2.12	0.55	**11.41**
12.75	2.17	0.59	6.22
13.00	2.22	0.61	3.86
13.25	2.26	0.64	2.81
13.50	2.30	0.66	2.25
13.75	2.33	0.68	1.91
14.00	2.36	0.70	1.68
14.25	2.39	0.72	1.50
14.50	2.41	0.73	1.36
14.75	2.44	0.75	1.28
15.00	2.46	0.76	1.21
15.25	2.48	0.77	1.16
15.50	2.50	0.79	1.10
15.75	2.52	0.80	1.04
16.00	2.53	0.81	0.98
16.25	2.55	0.82	0.92
16.50	2.57	0.83	0.87
16.75	2.58	0.84	0.84
17.00	2.60	0.85	0.82
17.25	2.61	0.86	0.80
17.50	2.63	0.87	0.77
17.75	2.64	0.88	0.75
18.00	2.65	0.89	0.73
18.25	2.67	0.90	0.71
18.50	2.68	0.91	0.69
18.75	2.69	0.91	0.67
19.00	2.70	0.92	0.64
19.25	2.71	0.93	0.62
19.50	2.72	0.94	0.60
19.75	2.73	0.94	0.57
20.00	**2.74**	**0.95**	0.55

Summary for Reach 4R: Reach

Inflow Area = 863,011 sf, 0.00% Impervious, Inflow Depth > 0.74" for 2yr event
Inflow = 11.16 cfs @ 12.36 hrs, Volume= 52,920 cf
Outflow = 11.16 cfs @ 12.36 hrs, Volume= 52,920 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 4R: Reach



Hydrograph for Reach 4R: Reach

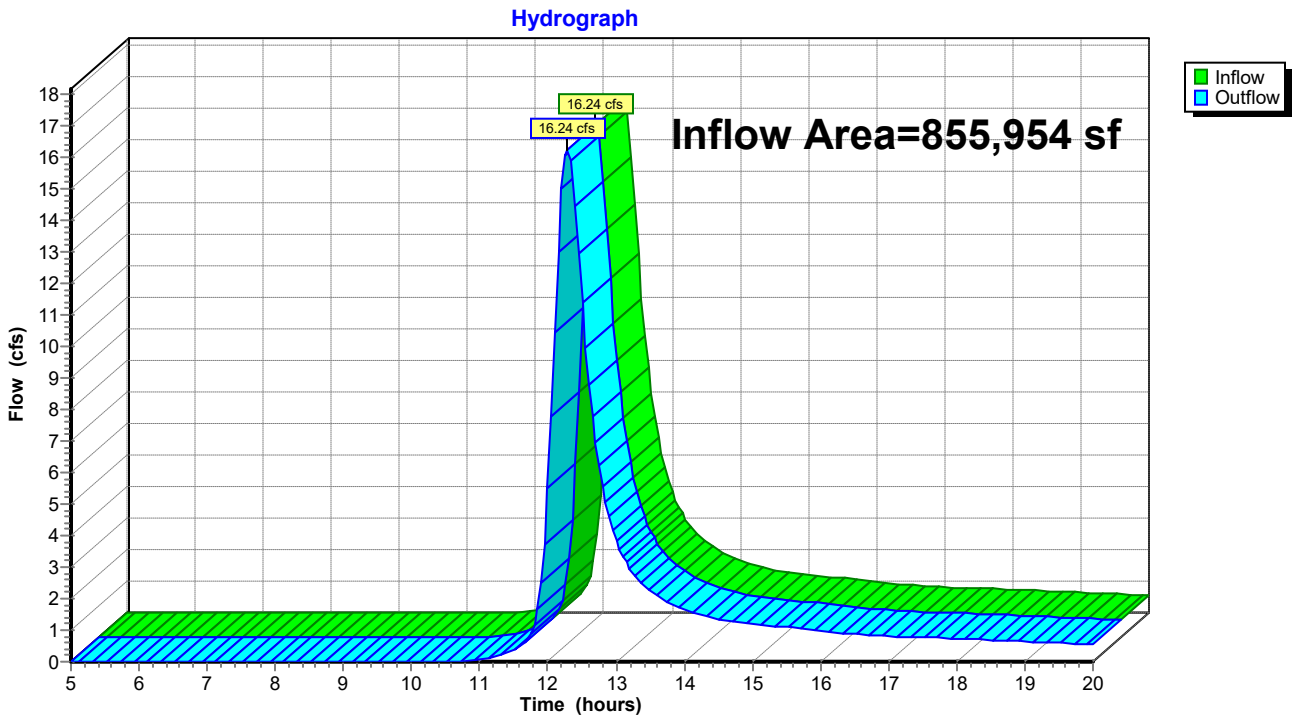
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.00		0.00
8.50	0.00		0.00
8.75	0.00		0.00
9.00	0.00		0.00
9.25	0.00		0.00
9.50	0.00		0.00
9.75	0.00		0.00
10.00	0.00		0.00
10.25	0.00		0.00
10.50	0.00		0.00
10.75	0.00		0.00
11.00	0.00		0.00
11.25	0.00		0.00
11.50	0.02		0.02
11.75	0.20		0.20
12.00	2.41		2.41
12.25	**9.99**		**9.99**
12.50	**9.89**		**9.89**
12.75	5.89		5.89
13.00	3.76		3.76
13.25	2.68		2.68
13.50	2.10		2.10
13.75	1.76		1.76
14.00	1.51		1.51
14.25	1.34		1.34
14.50	1.22		1.22
14.75	1.13		1.13
15.00	1.07		1.07
15.25	1.02		1.02
15.50	0.97		0.97
15.75	0.92		0.92
16.00	0.87		0.87
16.25	0.82		0.82
16.50	0.78		0.78
16.75	0.75		0.75
17.00	0.72		0.72
17.25	0.70		0.70
17.50	0.69		0.69
17.75	0.67		0.67
18.00	0.65		0.65
18.25	0.63		0.63
18.50	0.61		0.61
18.75	0.59		0.59
19.00	0.57		0.57
19.25	0.55		0.55
19.50	0.53		0.53
19.75	0.51		0.51
20.00	0.49		0.49

Summary for Reach 5R: Reach

Inflow Area = 855,954 sf, 0.00% Impervious, Inflow Depth > 0.94" for 2yr event
Inflow = 16.24 cfs @ 12.28 hrs, Volume= 66,782 cf
Outflow = 16.24 cfs @ 12.28 hrs, Volume= 66,782 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Reach



Hydrograph for Reach 5R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	0.75		0.75
5.25	0.00		0.00	18.00	0.73		0.73
5.50	0.00		0.00	18.25	0.71		0.71
5.75	0.00		0.00	18.50	0.69		0.69
6.00	0.00		0.00	18.75	0.67		0.67
6.25	0.00		0.00	19.00	0.64		0.64
6.50	0.00		0.00	19.25	0.62		0.62
6.75	0.00		0.00	19.50	0.60		0.60
7.00	0.00		0.00	19.75	0.57		0.57
7.25	0.00		0.00	20.00	0.55		0.55
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.00		0.00				
10.50	0.00		0.00				
10.75	0.02		0.02				
11.00	0.07		0.07				
11.25	0.18		0.18				
11.50	0.37		0.37				
11.75	0.87		0.87				
12.00	5.49		5.49				
12.25	**16.08**		**16.08**				
12.50	**11.41**		**11.41**				
12.75	6.22		6.22				
13.00	3.86		3.86				
13.25	2.81		2.81				
13.50	2.25		2.25				
13.75	1.91		1.91				
14.00	1.68		1.68				
14.25	1.50		1.50				
14.50	1.36		1.36				
14.75	1.28		1.28				
15.00	1.21		1.21				
15.25	1.16		1.16				
15.50	1.10		1.10				
15.75	1.04		1.04				
16.00	0.98		0.98				
16.25	0.92		0.92				
16.50	0.87		0.87				
16.75	0.84		0.84				
17.00	0.82		0.82				
17.25	0.80		0.80				
17.50	0.77		0.77				

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 16S: DA-1 Runoff Area=19.812 ac 0.00% Impervious Runoff Depth>1.54"
Flow Length=1,699' Tc=36.8 min CN=74 Runoff=24.72 cfs 110,576 cf

Subcatchment 17S: DA-1 Runoff Area=19.650 ac 0.00% Impervious Runoff Depth>1.83"
Flow Length=1,829' Tc=31.8 min CN=78 Runoff=32.56 cfs 130,301 cf

Reach 4R: Reach Inflow=24.72 cfs 110,576 cf
Outflow=24.72 cfs 110,576 cf

Reach 5R: Reach Inflow=32.56 cfs 130,301 cf
Outflow=32.56 cfs 130,301 cf

Total Runoff Area = 1,718,965 sf Runoff Volume = 240,876 cf Average Runoff Depth = 1.68"
100.00% Pervious = 1,718,965 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 16S: DA-1

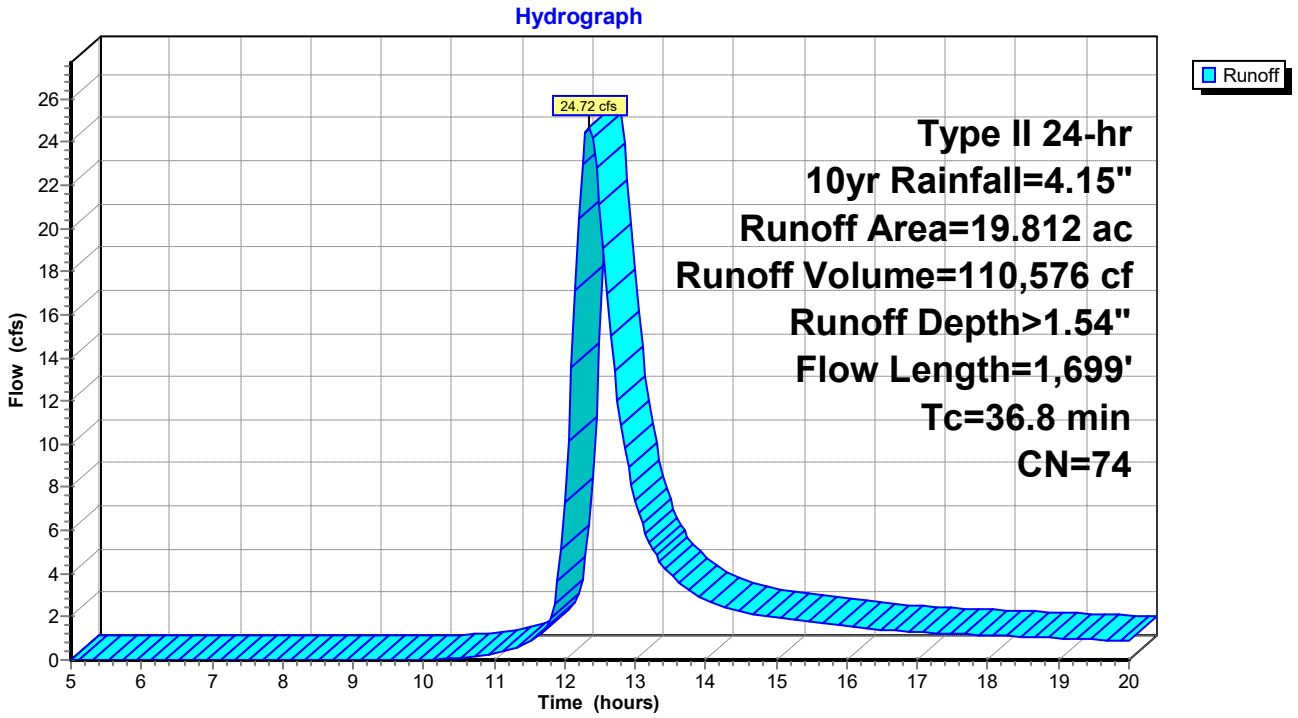
Runoff = 24.72 cfs @ 12.34 hrs, Volume= 110,576 cf, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

	Area (ac)	CN	Description
	2.719	73	Woods, Fair, HSG C
	0.707	79	Woods, Fair, HSG D
	4.572	78	Meadow, non-grazed, HSG D
*	11.340	71	Meadow, non-grazed, HSG C
	0.262	89	Gravel roads, HSG C
	0.212	91	Gravel roads, HSG D
	19.812	74	Weighted Average
	19.812		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	78	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
3.6	178	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	625	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0170	2.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
36.8	1,699	Total			

Subcatchment 16S: DA-1



Hydrograph for Subcatchment 16S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.00
6.75	0.39	0.00	0.00
7.00	0.41	0.00	0.00
7.25	0.43	0.00	0.00
7.50	0.45	0.00	0.00
7.75	0.48	0.00	0.00
8.00	0.50	0.00	0.00
8.25	0.52	0.00	0.00
8.50	0.55	0.00	0.00
8.75	0.58	0.00	0.00
9.00	0.61	0.00	0.00
9.25	0.64	0.00	0.00
9.50	0.68	0.00	0.00
9.75	0.71	0.00	0.00
10.00	0.75	0.00	0.00
10.25	0.80	0.00	0.03
10.50	0.85	0.01	0.09
10.75	0.91	0.01	0.18
11.00	0.98	0.02	0.32
11.25	1.06	0.03	0.52
11.50	1.17	0.06	0.84
11.75	1.61	0.18	1.58
12.00	2.75	0.75	7.31
12.25	2.93	0.86	**23.01**
12.50	3.05	0.94	**21.09**
12.75	3.13	0.99	12.03
13.00	3.20	1.04	7.41
13.25	3.26	1.08	5.13
13.50	3.32	1.11	3.95
13.75	3.36	1.15	3.27
14.00	3.40	1.17	2.78
14.25	3.44	1.20	2.46
14.50	3.48	1.22	2.22
14.75	3.51	1.25	2.06
15.00	3.54	1.27	1.95
15.25	3.57	1.29	1.85
15.50	3.60	1.31	1.75
15.75	3.63	1.33	1.66
16.00	3.65	1.35	1.56
16.25	3.68	1.36	1.47
16.50	3.70	1.38	1.39
16.75	3.72	1.39	1.33
17.00	3.74	1.41	1.29
17.25	3.76	1.42	1.25
17.50	3.78	1.44	1.22
17.75	3.80	1.45	1.19
18.00	3.82	1.47	1.15
18.25	3.84	1.48	1.12
18.50	3.86	1.49	1.08
18.75	3.88	1.51	1.05
19.00	3.89	1.52	1.01
19.25	3.91	1.53	0.98
19.50	3.92	1.54	0.94
19.75	3.94	1.55	0.91
20.00	**3.95**	**1.56**	0.87

Summary for Subcatchment 17S: DA-1

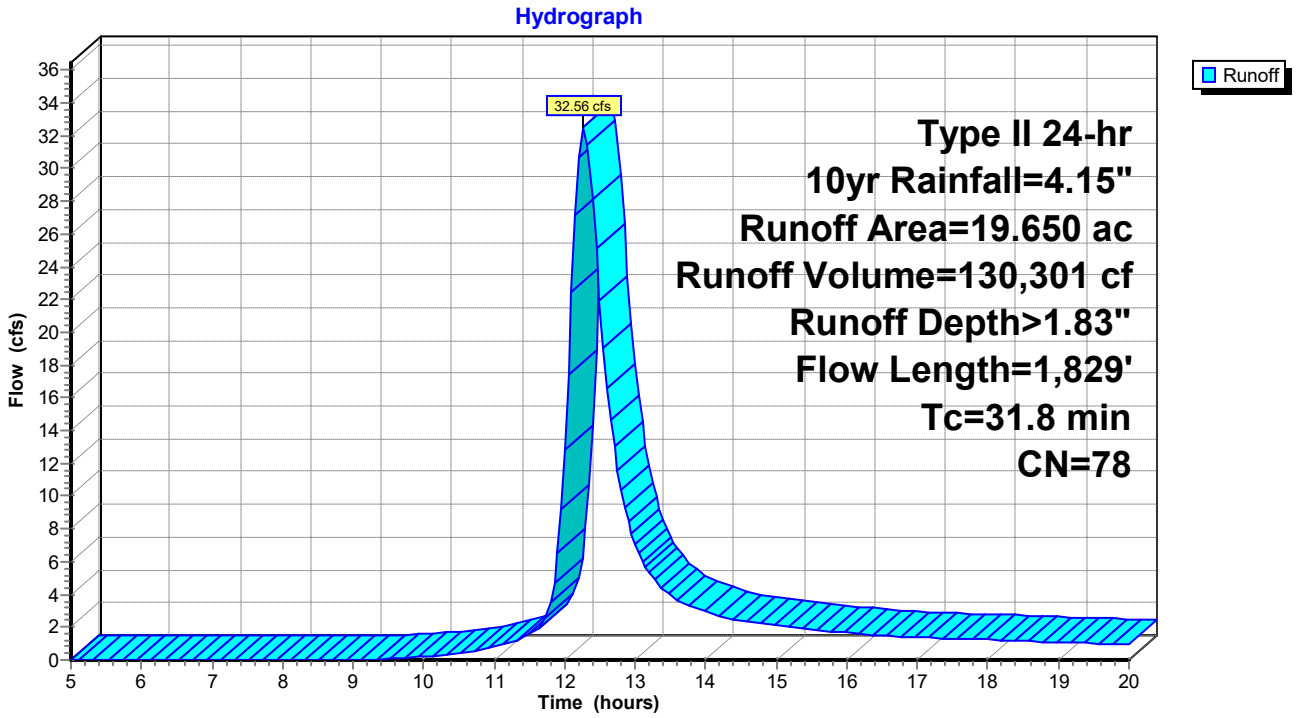
Runoff = 32.56 cfs @ 12.27 hrs, Volume= 130,301 cf, Depth> 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

Area (ac)	CN	Description
1.385	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.395	71	Meadow, non-grazed, HSG C
4.315	78	Meadow, non-grazed, HSG D
4.982	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
19.650	78	Weighted Average
19.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	90	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
5.6	309	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	282	0.0410	2.12	2.12	**Channel Flow, #6** Area= 1.0 sf Perim= 4.5' r= 0.22' n= 0.052
0.2	125	0.0230	9.01	15.93	**Pipe Channel, Culvert #8** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
1.9	245	0.0200	2.14	4.92	**Channel Flow, #4** Area= 2.3 sf Perim= 5.8' r= 0.40' n= 0.053
0.1	40	0.0100	5.94	10.50	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
31.8	1,829	Total			

Subcatchment 17S: DA-1



Hydrograph for Subcatchment 17S: DA-1

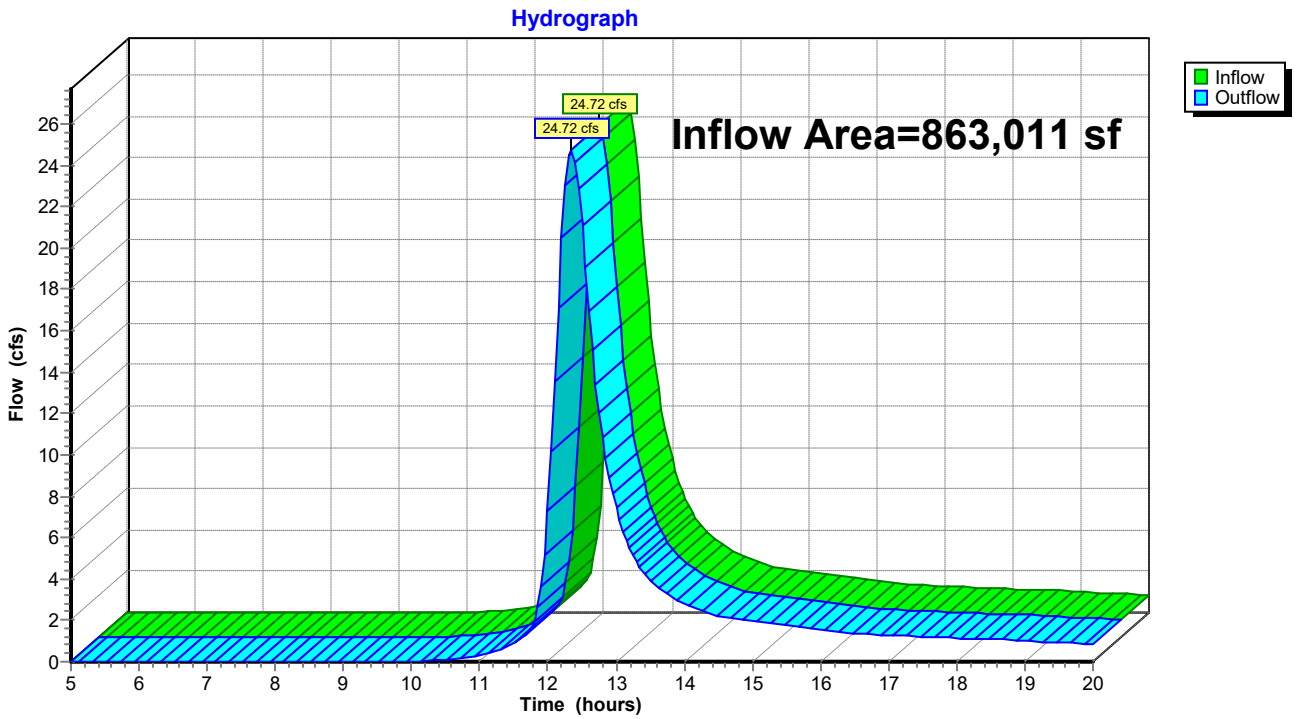
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.00
6.75	0.39	0.00	0.00
7.00	0.41	0.00	0.00
7.25	0.43	0.00	0.00
7.50	0.45	0.00	0.00
7.75	0.48	0.00	0.00
8.00	0.50	0.00	0.00
8.25	0.52	0.00	0.00
8.50	0.55	0.00	0.00
8.75	0.58	0.00	0.00
9.00	0.61	0.00	0.01
9.25	0.64	0.00	0.04
9.50	0.68	0.00	0.09
9.75	0.71	0.01	0.14
10.00	0.75	0.01	0.21
10.25	0.80	0.02	0.30
10.50	0.85	0.03	0.42
10.75	0.91	0.04	0.58
11.00	0.98	0.05	0.79
11.25	1.06	0.07	1.10
11.50	1.17	0.11	1.58
11.75	1.61	0.28	2.81
12.00	2.75	0.96	12.82
12.25	2.93	1.08	**32.40**
12.50	3.05	1.16	21.93
12.75	3.13	1.23	11.57
13.00	3.20	1.28	7.01
13.25	3.26	1.32	5.01
13.50	3.32	1.36	3.96
13.75	3.36	1.39	3.32
14.00	3.40	1.42	2.92
14.25	3.44	1.45	2.59
14.50	3.48	1.48	2.35
14.75	3.51	1.50	2.21
15.00	3.54	1.53	2.09
15.25	3.57	1.55	1.98
15.50	3.60	1.57	1.88
15.75	3.63	1.59	1.77
16.00	3.65	1.61	1.67
16.25	3.68	1.63	1.56
16.50	3.70	1.65	1.48
16.75	3.72	1.67	1.43
17.00	3.74	1.68	1.39
17.25	3.76	1.70	1.35
17.50	3.78	1.72	1.31
17.75	3.80	1.73	1.27
18.00	3.82	1.75	1.24
18.25	3.84	1.76	1.20
18.50	3.86	1.77	1.16
18.75	3.88	1.79	1.12
19.00	3.89	1.80	1.08
19.25	3.91	1.81	1.04
19.50	3.92	1.83	1.00
19.75	3.94	1.84	0.97
20.00	**3.95**	**1.85**	0.93

Summary for Reach 4R: Reach

Inflow Area = 863,011 sf, 0.00% Impervious, Inflow Depth > 1.54" for 10yr event
Inflow = 24.72 cfs @ 12.34 hrs, Volume= 110,576 cf
Outflow = 24.72 cfs @ 12.34 hrs, Volume= 110,576 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 4R: Reach



Hydrograph for Reach 4R: Reach

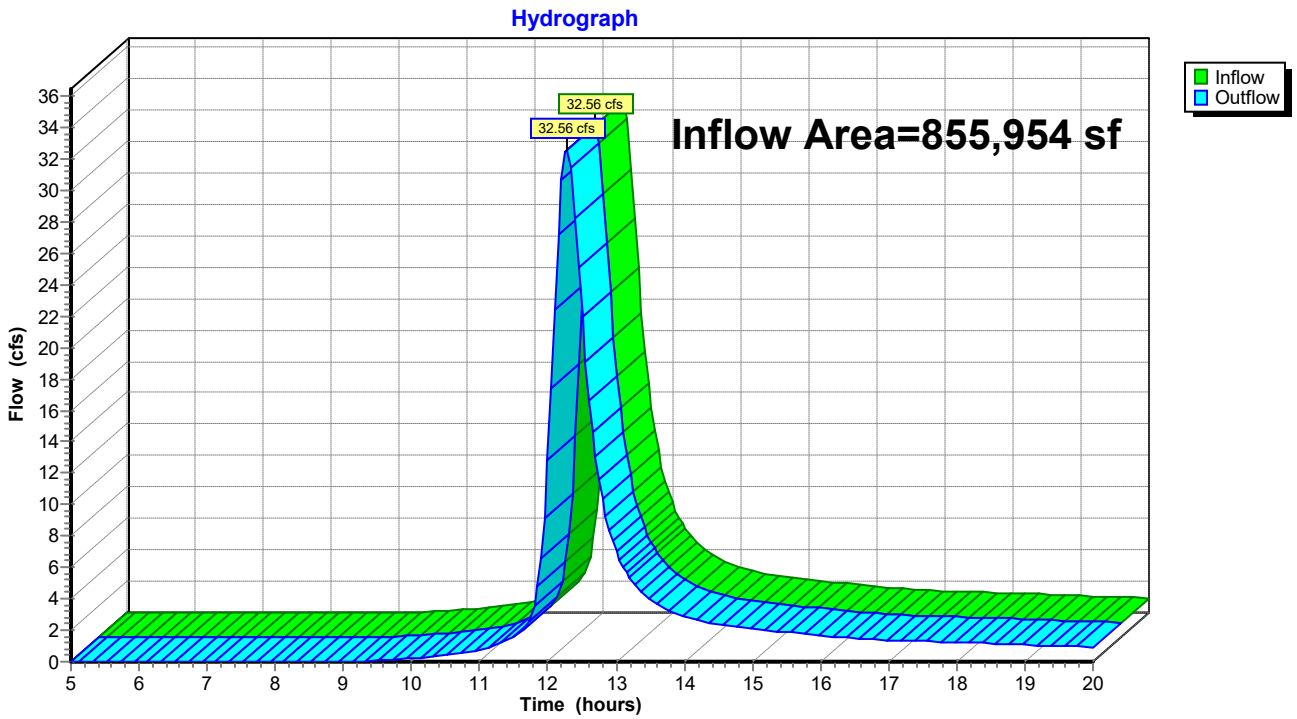
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	1.19		1.19
5.25	0.00		0.00	18.00	1.15		1.15
5.50	0.00		0.00	18.25	1.12		1.12
5.75	0.00		0.00	18.50	1.08		1.08
6.00	0.00		0.00	18.75	1.05		1.05
6.25	0.00		0.00	19.00	1.01		1.01
6.50	0.00		0.00	19.25	0.98		0.98
6.75	0.00		0.00	19.50	0.94		0.94
7.00	0.00		0.00	19.75	0.91		0.91
7.25	0.00		0.00	20.00	0.87		0.87
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.00		0.00				
10.25	0.03		0.03				
10.50	0.09		0.09				
10.75	0.18		0.18				
11.00	0.32		0.32				
11.25	0.52		0.52				
11.50	0.84		0.84				
11.75	1.58		1.58				
12.00	7.31		7.31				
12.25	**23.01**		**23.01**				
12.50	**21.09**		**21.09**				
12.75	12.03		12.03				
13.00	7.41		7.41				
13.25	5.13		5.13				
13.50	3.95		3.95				
13.75	3.27		3.27				
14.00	2.78		2.78				
14.25	2.46		2.46				
14.50	2.22		2.22				
14.75	2.06		2.06				
15.00	1.95		1.95				
15.25	1.85		1.85				
15.50	1.75		1.75				
15.75	1.66		1.66				
16.00	1.56		1.56				
16.25	1.47		1.47				
16.50	1.39		1.39				
16.75	1.33		1.33				
17.00	1.29		1.29				
17.25	1.25		1.25				
17.50	1.22		1.22				

Summary for Reach 5R: Reach

Inflow Area = 855,954 sf, 0.00% Impervious, Inflow Depth > 1.83" for 10yr event
Inflow = 32.56 cfs @ 12.27 hrs, Volume= 130,301 cf
Outflow = 32.56 cfs @ 12.27 hrs, Volume= 130,301 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Reach



Hydrograph for Reach 5R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	1.27		1.27
5.25	0.00		0.00	18.00	1.24		1.24
5.50	0.00		0.00	18.25	1.20		1.20
5.75	0.00		0.00	18.50	1.16		1.16
6.00	0.00		0.00	18.75	1.12		1.12
6.25	0.00		0.00	19.00	1.08		1.08
6.50	0.00		0.00	19.25	1.04		1.04
6.75	0.00		0.00	19.50	1.00		1.00
7.00	0.00		0.00	19.75	0.97		0.97
7.25	0.00		0.00	20.00	0.93		0.93
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.01		0.01				
9.25	0.04		0.04				
9.50	0.09		0.09				
9.75	0.14		0.14				
10.00	0.21		0.21				
10.25	0.30		0.30				
10.50	0.42		0.42				
10.75	0.58		0.58				
11.00	0.79		0.79				
11.25	1.10		1.10				
11.50	1.58		1.58				
11.75	2.81		2.81				
12.00	12.82		12.82				
12.25	**32.40**		**32.40**				
12.50	21.93		21.93				
12.75	11.57		11.57				
13.00	7.01		7.01				
13.25	5.01		5.01				
13.50	3.96		3.96				
13.75	3.32		3.32				
14.00	2.92		2.92				
14.25	2.59		2.59				
14.50	2.35		2.35				
14.75	2.21		2.21				
15.00	2.09		2.09				
15.25	1.98		1.98				
15.50	1.88		1.88				
15.75	1.77		1.77				
16.00	1.67		1.67				
16.25	1.56		1.56				
16.50	1.48		1.48				
16.75	1.43		1.43				
17.00	1.39		1.39				
17.25	1.35		1.35				
17.50	1.31		1.31				

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 16S: DA-1 Runoff Area=19.812 ac 0.00% Impervious Runoff Depth>2.19"
Flow Length=1,699' Tc=36.8 min CN=74 Runoff=35.59 cfs 157,449 cf

Subcatchment 17S: DA-1 Runoff Area=19.650 ac 0.00% Impervious Runoff Depth>2.53"
Flow Length=1,829' Tc=31.8 min CN=78 Runoff=45.18 cfs 180,459 cf

Reach 4R: Reach Inflow=35.59 cfs 157,449 cf
Outflow=35.59 cfs 157,449 cf

Reach 5R: Reach Inflow=45.18 cfs 180,459 cf
Outflow=45.18 cfs 180,459 cf

Total Runoff Area = 1,718,965 sf Runoff Volume = 337,908 cf Average Runoff Depth = 2.36"
100.00% Pervious = 1,718,965 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 16S: DA-1

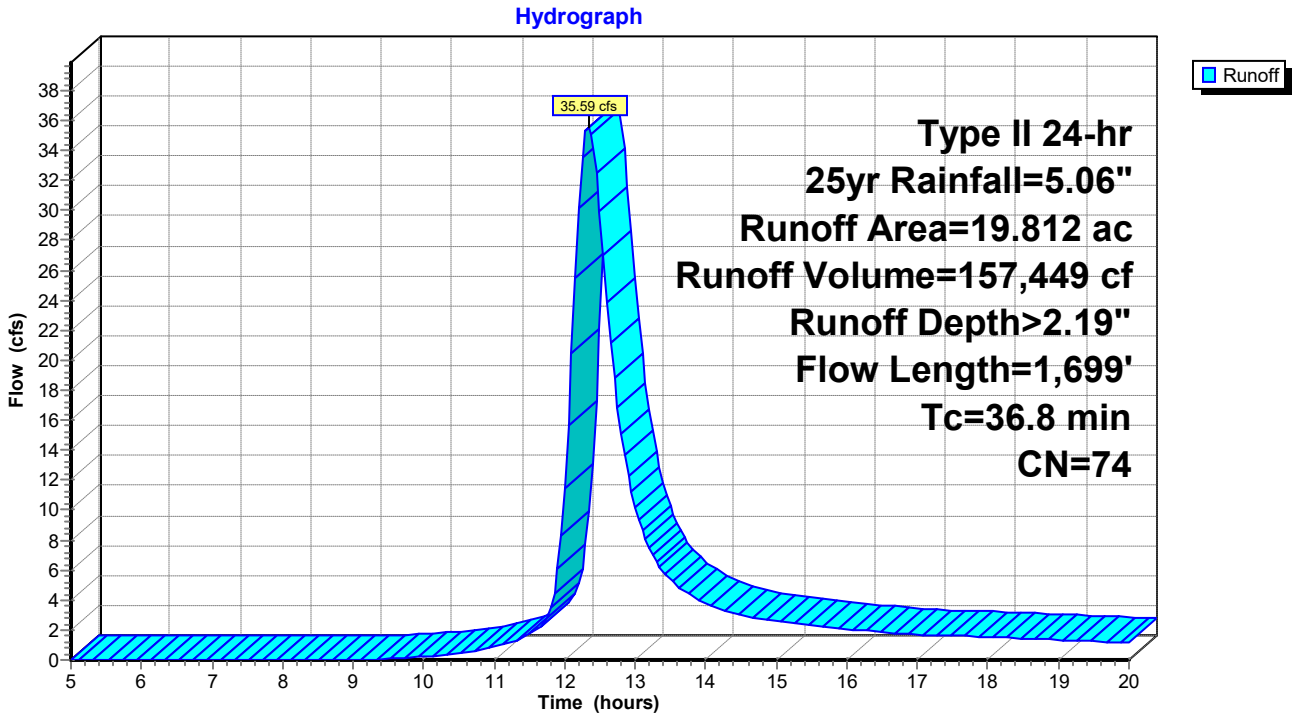
Runoff = 35.59 cfs @ 12.33 hrs, Volume= 157,449 cf, Depth> 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=5.06"

	Area (ac)	CN	Description
	2.719	73	Woods, Fair, HSG C
	0.707	79	Woods, Fair, HSG D
	4.572	78	Meadow, non-grazed, HSG D
*	11.340	71	Meadow, non-grazed, HSG C
	0.262	89	Gravel roads, HSG C
	0.212	91	Gravel roads, HSG D
	19.812	74	Weighted Average
	19.812		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	78	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
3.6	178	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	625	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0170	2.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
36.8	1,699	Total			

Subcatchment 16S: DA-1



Hydrograph for Subcatchment 16S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.32	0.00	0.00
5.25	0.34	0.00	0.00
5.50	0.36	0.00	0.00
5.75	0.38	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.43	0.00	0.00
6.50	0.45	0.00	0.00
6.75	0.48	0.00	0.00
7.00	0.50	0.00	0.00
7.25	0.53	0.00	0.00
7.50	0.55	0.00	0.00
7.75	0.58	0.00	0.00
8.00	0.61	0.00	0.00
8.25	0.64	0.00	0.00
8.50	0.67	0.00	0.00
8.75	0.70	0.00	0.00
9.00	0.74	0.00	0.00
9.25	0.78	0.00	0.02
9.50	0.82	0.00	0.07
9.75	0.87	0.01	0.13
10.00	0.92	0.01	0.21
10.25	0.97	0.02	0.30
10.50	1.03	0.03	0.43
10.75	1.10	0.04	0.61
11.00	1.19	0.06	0.84
11.25	1.30	0.09	1.18
11.50	1.43	0.13	1.69
11.75	1.96	0.33	2.86
12.00	3.35	1.14	11.48
12.25	3.57	1.29	**33.50**
12.50	3.72	1.39	**29.93**
12.75	3.82	1.47	16.81
13.00	3.91	1.53	10.22
13.25	3.98	1.58	7.00
13.50	4.04	1.63	5.35
13.75	4.10	1.67	4.40
14.00	4.15	1.71	3.73
14.25	4.19	1.74	3.29
14.50	4.24	1.77	2.96
14.75	4.28	1.80	2.75
15.00	4.32	1.83	2.60
15.25	4.36	1.86	2.46
15.50	4.39	1.89	2.33
15.75	4.42	1.91	2.20
16.00	4.45	1.94	2.08
16.25	4.48	1.96	1.95
16.50	4.51	1.98	1.84
16.75	4.54	2.00	1.77
17.00	4.56	2.02	1.71
17.25	4.59	2.04	1.66
17.50	4.61	2.06	1.61
17.75	4.64	2.08	1.57
18.00	4.66	2.10	1.52
18.25	4.68	2.11	1.48
18.50	4.70	2.13	1.43
18.75	4.73	2.15	1.38
19.00	4.75	2.16	1.34
19.25	4.76	2.18	1.29
19.50	4.78	2.19	1.24
19.75	4.80	2.21	1.19
20.00	**4.82**	**2.22**	1.15

Summary for Subcatchment 17S: DA-1

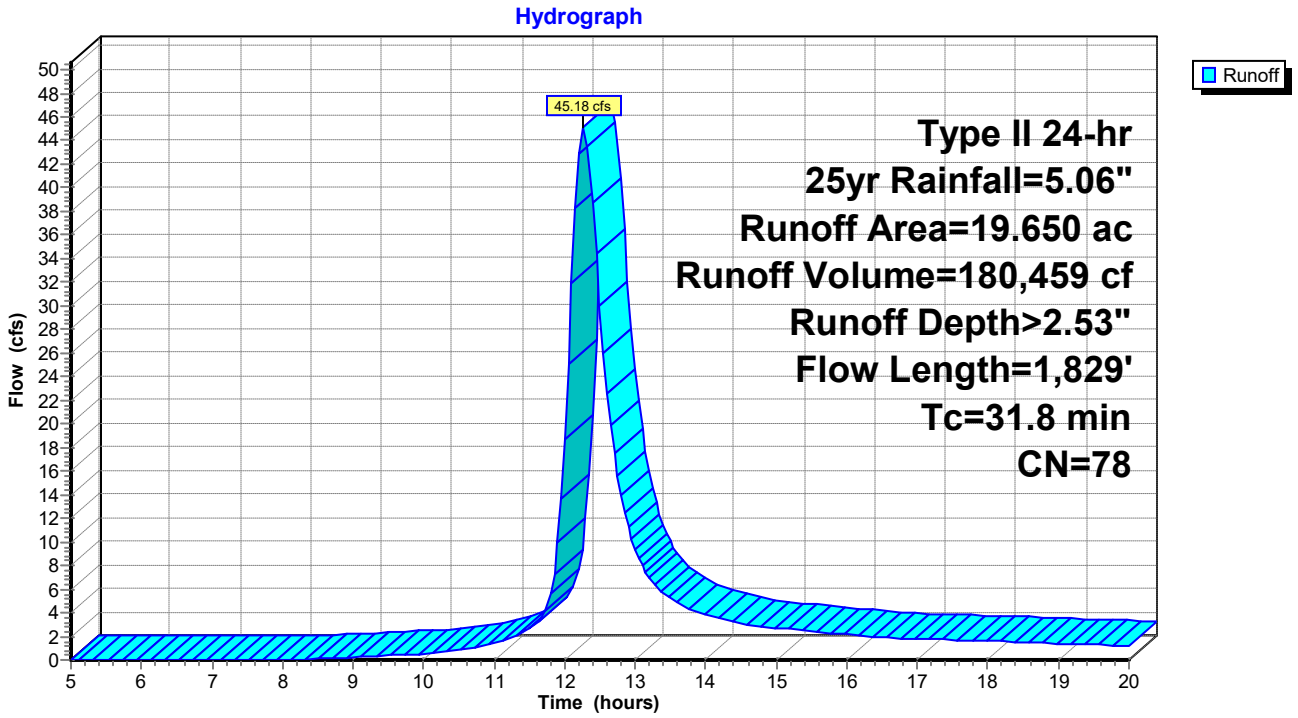
Runoff = 45.18 cfs @ 12.27 hrs, Volume= 180,459 cf, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=5.06"

Area (ac)	CN	Description
1.385	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.395	71	Meadow, non-grazed, HSG C
4.315	78	Meadow, non-grazed, HSG D
4.982	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
19.650	78	Weighted Average
19.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	90	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
5.6	309	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	282	0.0410	2.12	2.12	**Channel Flow, #6** Area= 1.0 sf Perim= 4.5' r= 0.22' n= 0.052
0.2	125	0.0230	9.01	15.93	**Pipe Channel, Culvert #8** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
1.9	245	0.0200	2.14	4.92	**Channel Flow, #4** Area= 2.3 sf Perim= 5.8' r= 0.40' n= 0.053
0.1	40	0.0100	5.94	10.50	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
31.8	1,829	Total			

Subcatchment 17S: DA-1



Hydrograph for Subcatchment 17S: DA-1

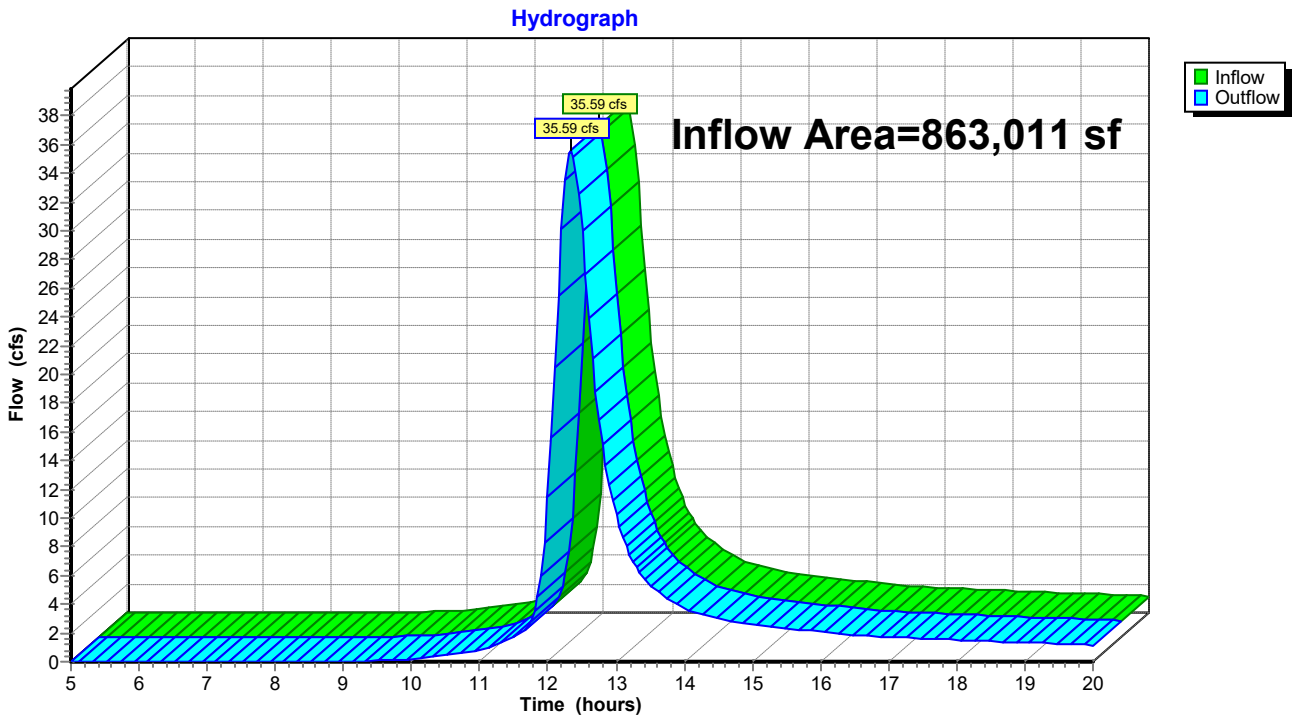
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.32	0.00	0.00
5.25	0.34	0.00	0.00
5.50	0.36	0.00	0.00
5.75	0.38	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.43	0.00	0.00
6.50	0.45	0.00	0.00
6.75	0.48	0.00	0.00
7.00	0.50	0.00	0.00
7.25	0.53	0.00	0.00
7.50	0.55	0.00	0.00
7.75	0.58	0.00	0.00
8.00	0.61	0.00	0.01
8.25	0.64	0.00	0.03
8.50	0.67	0.00	0.07
8.75	0.70	0.01	0.13
9.00	0.74	0.01	0.20
9.25	0.78	0.02	0.28
9.50	0.82	0.02	0.37
9.75	0.87	0.03	0.45
10.00	0.92	0.04	0.55
10.25	0.97	0.05	0.69
10.50	1.03	0.07	0.88
10.75	1.10	0.09	1.12
11.00	1.19	0.11	1.46
11.25	1.30	0.15	1.91
11.50	1.43	0.20	2.64
11.75	1.96	0.46	4.47
12.00	3.35	1.39	18.74
12.25	3.57	1.55	**45.04**
12.50	3.72	1.67	29.93
12.75	3.82	1.75	15.61
13.00	3.91	1.81	9.35
13.25	3.98	1.87	6.63
13.50	4.04	1.92	5.22
13.75	4.10	1.97	4.37
14.00	4.15	2.01	3.82
14.25	4.19	2.04	3.39
14.50	4.24	2.08	3.08
14.75	4.28	2.11	2.88
15.00	4.32	2.14	2.73
15.25	4.36	2.17	2.59
15.50	4.39	2.20	2.45
15.75	4.42	2.23	2.31
16.00	4.45	2.25	2.17
16.25	4.48	2.28	2.04
16.50	4.51	2.30	1.93
16.75	4.54	2.32	1.86
17.00	4.56	2.34	1.80
17.25	4.59	2.37	1.75
17.50	4.61	2.39	1.70
17.75	4.64	2.41	1.65
18.00	4.66	2.43	1.60
18.25	4.68	2.44	1.55
18.50	4.70	2.46	1.50
18.75	4.73	2.48	1.45
19.00	4.75	2.50	1.40
19.25	4.76	2.51	1.35
19.50	4.78	2.53	1.30
19.75	4.80	2.54	1.25
20.00	**4.82**	**2.56**	1.20

Summary for Reach 4R: Reach

Inflow Area = 863,011 sf, 0.00% Impervious, Inflow Depth > 2.19" for 25yr event
Inflow = 35.59 cfs @ 12.33 hrs, Volume= 157,449 cf
Outflow = 35.59 cfs @ 12.33 hrs, Volume= 157,449 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 4R: Reach



Hydrograph for Reach 4R: Reach

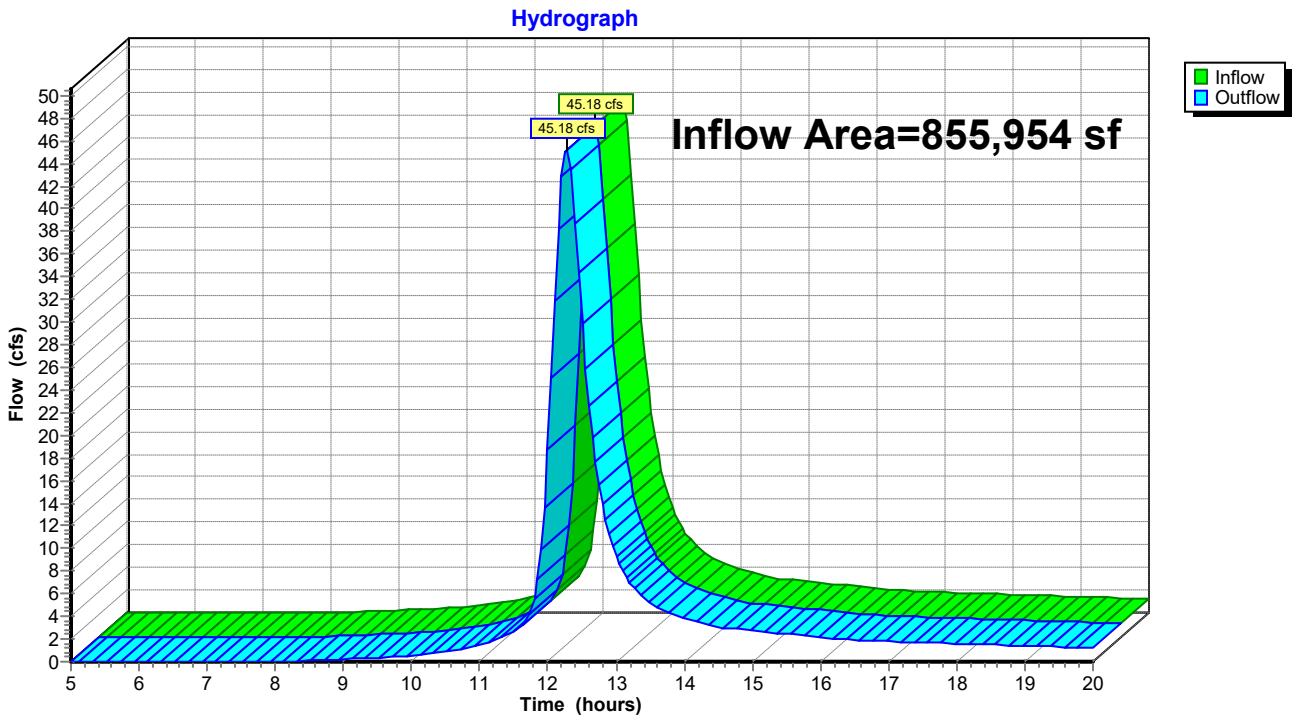
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	1.57		1.57
5.25	0.00		0.00	18.00	1.52		1.52
5.50	0.00		0.00	18.25	1.48		1.48
5.75	0.00		0.00	18.50	1.43		1.43
6.00	0.00		0.00	18.75	1.38		1.38
6.25	0.00		0.00	19.00	1.34		1.34
6.50	0.00		0.00	19.25	1.29		1.29
6.75	0.00		0.00	19.50	1.24		1.24
7.00	0.00		0.00	19.75	1.19		1.19
7.25	0.00		0.00	20.00	1.15		1.15
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.02		0.02				
9.50	0.07		0.07				
9.75	0.13		0.13				
10.00	0.21		0.21				
10.25	0.30		0.30				
10.50	0.43		0.43				
10.75	0.61		0.61				
11.00	0.84		0.84				
11.25	1.18		1.18				
11.50	1.69		1.69				
11.75	2.86		2.86				
12.00	11.48		11.48				
12.25	**33.50**		**33.50**				
12.50	**29.93**		**29.93**				
12.75	16.81		16.81				
13.00	10.22		10.22				
13.25	7.00		7.00				
13.50	5.35		5.35				
13.75	4.40		4.40				
14.00	3.73		3.73				
14.25	3.29		3.29				
14.50	2.96		2.96				
14.75	2.75		2.75				
15.00	2.60		2.60				
15.25	2.46		2.46				
15.50	2.33		2.33				
15.75	2.20		2.20				
16.00	2.08		2.08				
16.25	1.95		1.95				
16.50	1.84		1.84				
16.75	1.77		1.77				
17.00	1.71		1.71				
17.25	1.66		1.66				
17.50	1.61		1.61				

Summary for Reach 5R: Reach

Inflow Area = 855,954 sf, 0.00% Impervious, Inflow Depth > 2.53" for 25yr event
Inflow = 45.18 cfs @ 12.27 hrs, Volume= 180,459 cf
Outflow = 45.18 cfs @ 12.27 hrs, Volume= 180,459 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Reach



Hydrograph for Reach 5R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	1.65		1.65
5.25	0.00		0.00	18.00	1.60		1.60
5.50	0.00		0.00	18.25	1.55		1.55
5.75	0.00		0.00	18.50	1.50		1.50
6.00	0.00		0.00	18.75	1.45		1.45
6.25	0.00		0.00	19.00	1.40		1.40
6.50	0.00		0.00	19.25	1.35		1.35
6.75	0.00		0.00	19.50	1.30		1.30
7.00	0.00		0.00	19.75	1.25		1.25
7.25	0.00		0.00	20.00	1.20		1.20
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.01		0.01				
8.25	0.03		0.03				
8.50	0.07		0.07				
8.75	0.13		0.13				
9.00	0.20		0.20				
9.25	0.28		0.28				
9.50	0.37		0.37				
9.75	0.45		0.45				
10.00	0.55		0.55				
10.25	0.69		0.69				
10.50	0.88		0.88				
10.75	1.12		1.12				
11.00	1.46		1.46				
11.25	1.91		1.91				
11.50	2.64		2.64				
11.75	4.47		4.47				
12.00	18.74		18.74				
12.25	**45.04**		**45.04**				
12.50	29.93		29.93				
12.75	15.61		15.61				
13.00	9.35		9.35				
13.25	6.63		6.63				
13.50	5.22		5.22				
13.75	4.37		4.37				
14.00	3.82		3.82				
14.25	3.39		3.39				
14.50	3.08		3.08				
14.75	2.88		2.88				
15.00	2.73		2.73				
15.25	2.59		2.59				
15.50	2.45		2.45				
15.75	2.31		2.31				
16.00	2.17		2.17				
16.25	2.04		2.04				
16.50	1.93		1.93				
16.75	1.86		1.86				
17.00	1.80		1.80				
17.25	1.75		1.75				
17.50	1.70		1.70				

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 16S: DA-1 Runoff Area=19.812 ac 0.00% Impervious Runoff Depth>2.81"
Flow Length=1,699' Tc=36.8 min CN=74 Runoff=45.88 cfs 202,316 cf

Subcatchment 17S: DA-1 Runoff Area=19.650 ac 0.00% Impervious Runoff Depth>3.19"
Flow Length=1,829' Tc=31.8 min CN=78 Runoff=56.91 cfs 227,772 cf

Reach 4R: Reach Inflow=45.88 cfs 202,316 cf
Outflow=45.88 cfs 202,316 cf

Reach 5R: Reach Inflow=56.91 cfs 227,772 cf
Outflow=56.91 cfs 227,772 cf

Total Runoff Area = 1,718,965 sf Runoff Volume = 430,088 cf Average Runoff Depth = 3.00"
100.00% Pervious = 1,718,965 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 16S: DA-1

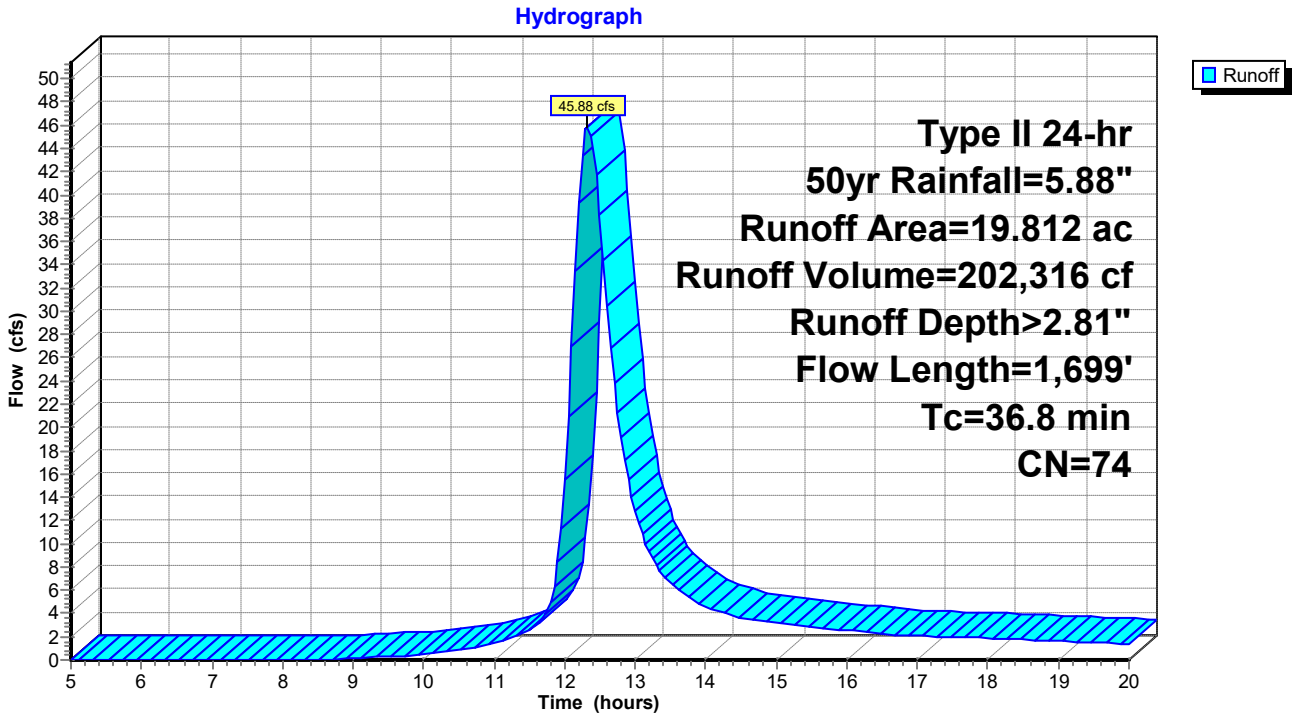
Runoff = 45.88 cfs @ 12.33 hrs, Volume= 202,316 cf, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.88"

	Area (ac)	CN	Description
	2.719	73	Woods, Fair, HSG C
	0.707	79	Woods, Fair, HSG D
	4.572	78	Meadow, non-grazed, HSG D
*	11.340	71	Meadow, non-grazed, HSG C
	0.262	89	Gravel roads, HSG C
	0.212	91	Gravel roads, HSG D
	19.812	74	Weighted Average
	19.812		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	78	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
3.6	178	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	625	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0170	2.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
36.8	1,699	Total			

Subcatchment 16S: DA-1



Hydrograph for Subcatchment 16S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.37	0.00	0.00
5.25	0.39	0.00	0.00
5.50	0.42	0.00	0.00
5.75	0.44	0.00	0.00
6.00	0.47	0.00	0.00
6.25	0.50	0.00	0.00
6.50	0.52	0.00	0.00
6.75	0.55	0.00	0.00
7.00	0.58	0.00	0.00
7.25	0.61	0.00	0.00
7.50	0.64	0.00	0.00
7.75	0.67	0.00	0.00
8.00	0.71	0.00	0.00
8.25	0.74	0.00	0.00
8.50	0.78	0.00	0.02
8.75	0.82	0.00	0.06
9.00	0.86	0.01	0.12
9.25	0.91	0.01	0.20
9.50	0.96	0.02	0.29
9.75	1.01	0.02	0.38
10.00	1.06	0.03	0.49
10.25	1.13	0.05	0.63
10.50	1.20	0.06	0.81
10.75	1.28	0.08	1.06
11.00	1.38	0.11	1.39
11.25	1.51	0.15	1.85
11.50	1.66	0.21	2.56
11.75	2.28	0.49	4.16
12.00	3.90	1.52	15.55
12.25	4.15	1.71	**43.45**
12.50	4.32	1.84	**38.22**
12.75	4.44	1.93	21.27
13.00	4.54	2.00	12.82
13.25	4.62	2.07	8.72
13.50	4.70	2.13	6.63
13.75	4.76	2.18	5.43
14.00	4.82	2.22	4.59
14.25	4.87	2.26	4.05
14.50	4.93	2.30	3.64
14.75	4.97	2.34	3.38
15.00	5.02	2.38	3.19
15.25	5.06	2.41	3.02
15.50	5.10	2.45	2.86
15.75	5.14	2.48	2.70
16.00	5.17	2.50	2.54
16.25	5.21	2.53	2.38
16.50	5.24	2.56	2.25
16.75	5.27	2.58	2.16
17.00	5.30	2.61	2.09
17.25	5.33	2.63	2.03
17.50	5.36	2.66	1.97
17.75	5.39	2.68	1.91
18.00	5.42	2.70	1.86
18.25	5.44	2.72	1.80
18.50	5.47	2.74	1.74
18.75	5.49	2.76	1.69
19.00	5.51	2.78	1.63
19.25	5.54	2.80	1.57
19.50	5.56	2.82	1.51
19.75	5.58	2.83	1.45
20.00	**5.60**	**2.85**	1.40

Summary for Subcatchment 17S: DA-1

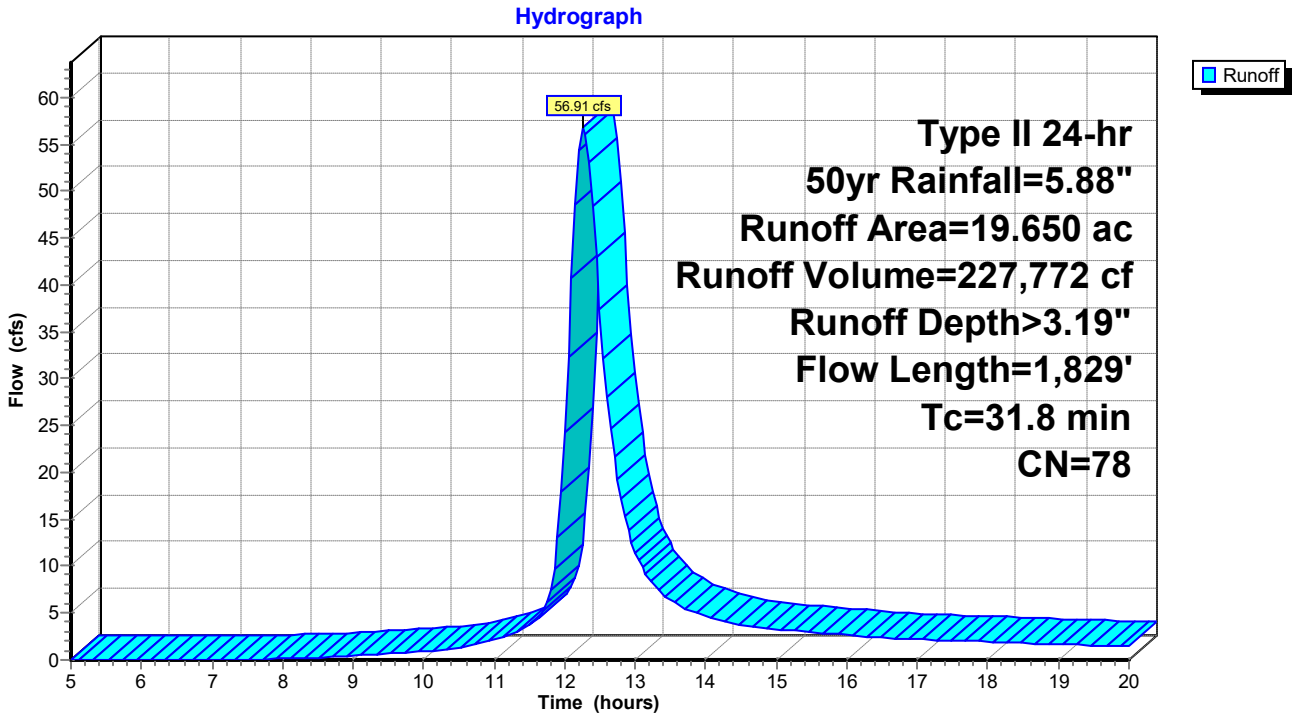
Runoff = 56.91 cfs @ 12.26 hrs, Volume= 227,772 cf, Depth> 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.88"

Area (ac)	CN	Description
1.385	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.395	71	Meadow, non-grazed, HSG C
4.315	78	Meadow, non-grazed, HSG D
4.982	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
19.650	78	Weighted Average
19.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	90	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
5.6	309	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	282	0.0410	2.12	2.12	**Channel Flow, #6** Area= 1.0 sf Perim= 4.5' r= 0.22' n= 0.052
0.2	125	0.0230	9.01	15.93	**Pipe Channel, Culvert #8** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
1.9	245	0.0200	2.14	4.92	**Channel Flow, #4** Area= 2.3 sf Perim= 5.8' r= 0.40' n= 0.053
0.1	40	0.0100	5.94	10.50	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
31.8	1,829	Total			

Subcatchment 17S: DA-1



Hydrograph for Subcatchment 17S: DA-1

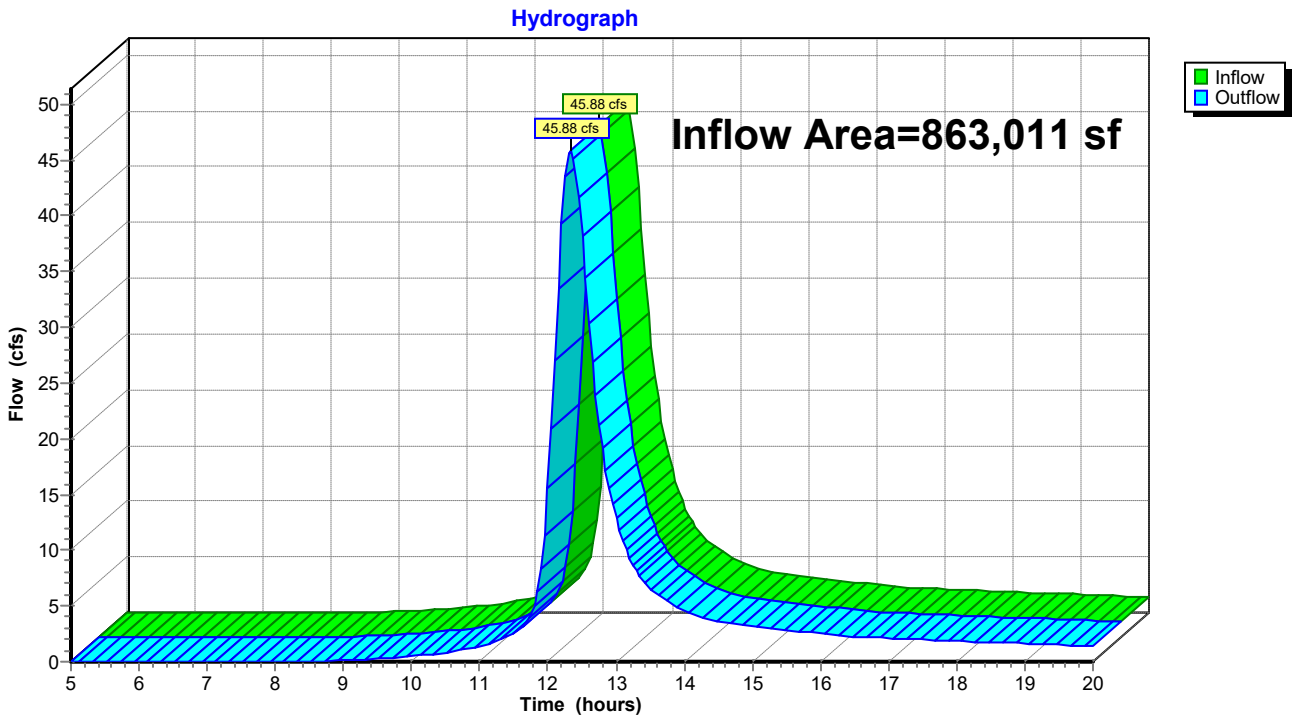
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.37	0.00	0.00
5.25	0.39	0.00	0.00
5.50	0.42	0.00	0.00
5.75	0.44	0.00	0.00
6.00	0.47	0.00	0.00
6.25	0.50	0.00	0.00
6.50	0.52	0.00	0.00
6.75	0.55	0.00	0.00
7.00	0.58	0.00	0.00
7.25	0.61	0.00	0.01
7.50	0.64	0.00	0.04
7.75	0.67	0.00	0.08
8.00	0.71	0.01	0.13
8.25	0.74	0.01	0.19
8.50	0.78	0.02	0.25
8.75	0.82	0.02	0.34
9.00	0.86	0.03	0.44
9.25	0.91	0.04	0.56
9.50	0.96	0.05	0.67
9.75	1.01	0.06	0.77
10.00	1.06	0.08	0.90
10.25	1.13	0.09	1.09
10.50	1.20	0.12	1.35
10.75	1.28	0.15	1.68
11.00	1.38	0.18	2.13
11.25	1.51	0.24	2.73
11.50	1.66	0.31	3.69
11.75	2.28	0.65	6.09
12.00	3.90	1.81	24.36
12.25	4.15	2.01	**56.79**
12.50	4.32	2.15	37.31
12.75	4.44	2.24	19.30
13.00	4.54	2.33	11.49
13.25	4.62	2.40	8.10
13.50	4.70	2.46	6.36
13.75	4.76	2.51	5.31
14.00	4.82	2.56	4.64
14.25	4.87	2.61	4.12
14.50	4.93	2.65	3.73
14.75	4.97	2.69	3.49
15.00	5.02	2.73	3.30
15.25	5.06	2.76	3.13
15.50	5.10	2.80	2.96
15.75	5.14	2.83	2.80
16.00	5.17	2.86	2.63
16.25	5.21	2.89	2.46
16.50	5.24	2.92	2.33
16.75	5.27	2.94	2.24
17.00	5.30	2.97	2.18
17.25	5.33	3.00	2.11
17.50	5.36	3.02	2.05
17.75	5.39	3.04	1.99
18.00	5.42	3.07	1.93
18.25	5.44	3.09	1.87
18.50	5.47	3.11	1.81
18.75	5.49	3.13	1.75
19.00	5.51	3.15	1.69
19.25	5.54	3.17	1.63
19.50	5.56	3.19	1.57
19.75	5.58	3.21	1.50
20.00	**5.60**	**3.23**	1.44

Summary for Reach 4R: Reach

Inflow Area = 863,011 sf, 0.00% Impervious, Inflow Depth > 2.81" for 50yr event
Inflow = 45.88 cfs @ 12.33 hrs, Volume= 202,316 cf
Outflow = 45.88 cfs @ 12.33 hrs, Volume= 202,316 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 4R: Reach



Hydrograph for Reach 4R: Reach

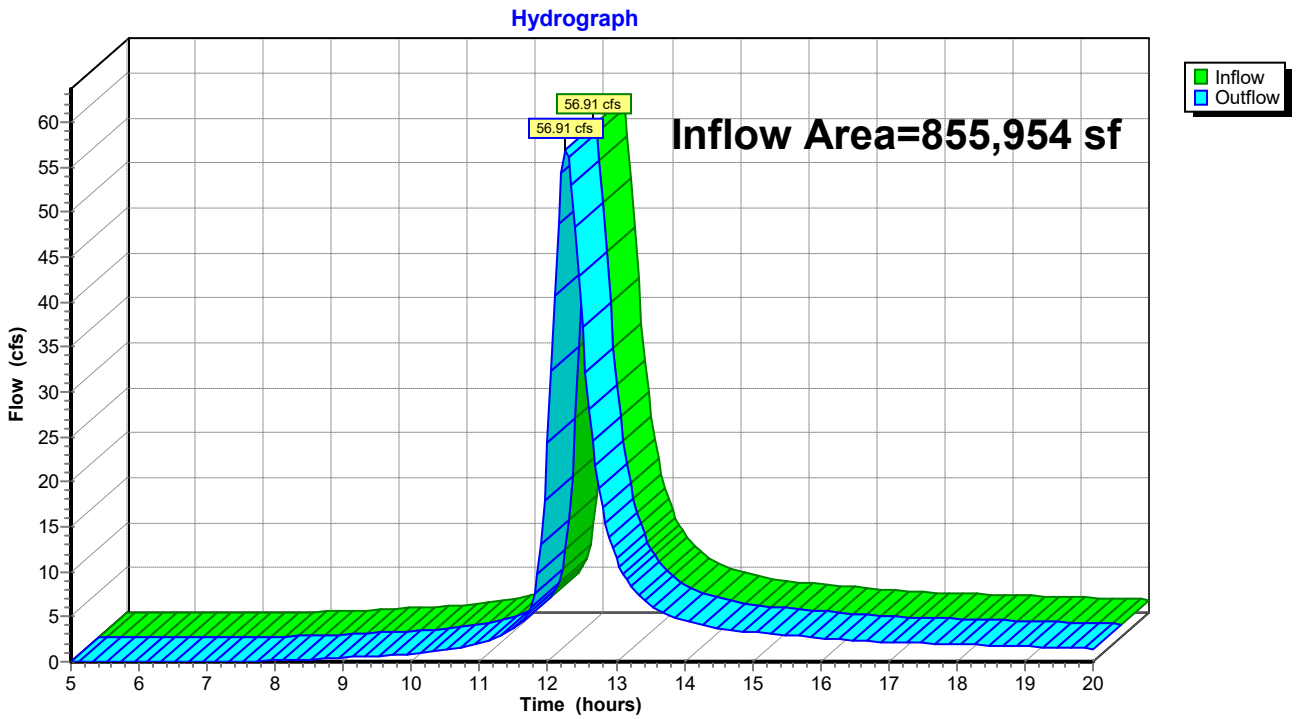
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	1.91		1.91
5.25	0.00		0.00	18.00	1.86		1.86
5.50	0.00		0.00	18.25	1.80		1.80
5.75	0.00		0.00	18.50	1.74		1.74
6.00	0.00		0.00	18.75	1.69		1.69
6.25	0.00		0.00	19.00	1.63		1.63
6.50	0.00		0.00	19.25	1.57		1.57
6.75	0.00		0.00	19.50	1.51		1.51
7.00	0.00		0.00	19.75	1.45		1.45
7.25	0.00		0.00	20.00	1.40		1.40
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.02		0.02				
8.75	0.06		0.06				
9.00	0.12		0.12				
9.25	0.20		0.20				
9.50	0.29		0.29				
9.75	0.38		0.38				
10.00	0.49		0.49				
10.25	0.63		0.63				
10.50	0.81		0.81				
10.75	1.06		1.06				
11.00	1.39		1.39				
11.25	1.85		1.85				
11.50	2.56		2.56				
11.75	4.16		4.16				
12.00	15.55		15.55				
12.25	**43.45**		**43.45**				
12.50	**38.22**		**38.22**				
12.75	21.27		21.27				
13.00	12.82		12.82				
13.25	8.72		8.72				
13.50	6.63		6.63				
13.75	5.43		5.43				
14.00	4.59		4.59				
14.25	4.05		4.05				
14.50	3.64		3.64				
14.75	3.38		3.38				
15.00	3.19		3.19				
15.25	3.02		3.02				
15.50	2.86		2.86				
15.75	2.70		2.70				
16.00	2.54		2.54				
16.25	2.38		2.38				
16.50	2.25		2.25				
16.75	2.16		2.16				
17.00	2.09		2.09				
17.25	2.03		2.03				
17.50	1.97		1.97				

Summary for Reach 5R: Reach

Inflow Area = 855,954 sf, 0.00% Impervious, Inflow Depth > 3.19" for 50yr event
Inflow = 56.91 cfs @ 12.26 hrs, Volume= 227,772 cf
Outflow = 56.91 cfs @ 12.26 hrs, Volume= 227,772 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Reach



Hydrograph for Reach 5R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	1.99		1.99
5.25	0.00		0.00	18.00	1.93		1.93
5.50	0.00		0.00	18.25	1.87		1.87
5.75	0.00		0.00	18.50	1.81		1.81
6.00	0.00		0.00	18.75	1.75		1.75
6.25	0.00		0.00	19.00	1.69		1.69
6.50	0.00		0.00	19.25	1.63		1.63
6.75	0.00		0.00	19.50	1.57		1.57
7.00	0.00		0.00	19.75	1.50		1.50
7.25	0.01		0.01	20.00	1.44		1.44
7.50	0.04		0.04				
7.75	0.08		0.08				
8.00	0.13		0.13				
8.25	0.19		0.19				
8.50	0.25		0.25				
8.75	0.34		0.34				
9.00	0.44		0.44				
9.25	0.56		0.56				
9.50	0.67		0.67				
9.75	0.77		0.77				
10.00	0.90		0.90				
10.25	1.09		1.09				
10.50	1.35		1.35				
10.75	1.68		1.68				
11.00	2.13		2.13				
11.25	2.73		2.73				
11.50	3.69		3.69				
11.75	6.09		6.09				
12.00	24.36		24.36				
12.25	**56.79**		**56.79**				
12.50	37.31		37.31				
12.75	19.30		19.30				
13.00	11.49		11.49				
13.25	8.10		8.10				
13.50	6.36		6.36				
13.75	5.31		5.31				
14.00	4.64		4.64				
14.25	4.12		4.12				
14.50	3.73		3.73				
14.75	3.49		3.49				
15.00	3.30		3.30				
15.25	3.13		3.13				
15.50	2.96		2.96				
15.75	2.80		2.80				
16.00	2.63		2.63				
16.25	2.46		2.46				
16.50	2.33		2.33				
16.75	2.24		2.24				
17.00	2.18		2.18				
17.25	2.11		2.11				
17.50	2.05		2.05				

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 16S: DA-1 Runoff Area=19.812 ac 0.00% Impervious Runoff Depth>3.58"
Flow Length=1,699' Tc=36.8 min CN=74 Runoff=58.41 cfs 257,142 cf

Subcatchment 17S: DA-1 Runoff Area=19.650 ac 0.00% Impervious Runoff Depth>4.00"
Flow Length=1,829' Tc=31.8 min CN=78 Runoff=70.90 cfs 284,969 cf

Reach 4R: Reach Inflow=58.41 cfs 257,142 cf
Outflow=58.41 cfs 257,142 cf

Reach 5R: Reach Inflow=70.90 cfs 284,969 cf
Outflow=70.90 cfs 284,969 cf

Total Runoff Area = 1,718,965 sf Runoff Volume = 542,111 cf Average Runoff Depth = 3.78"
100.00% Pervious = 1,718,965 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 16S: DA-1

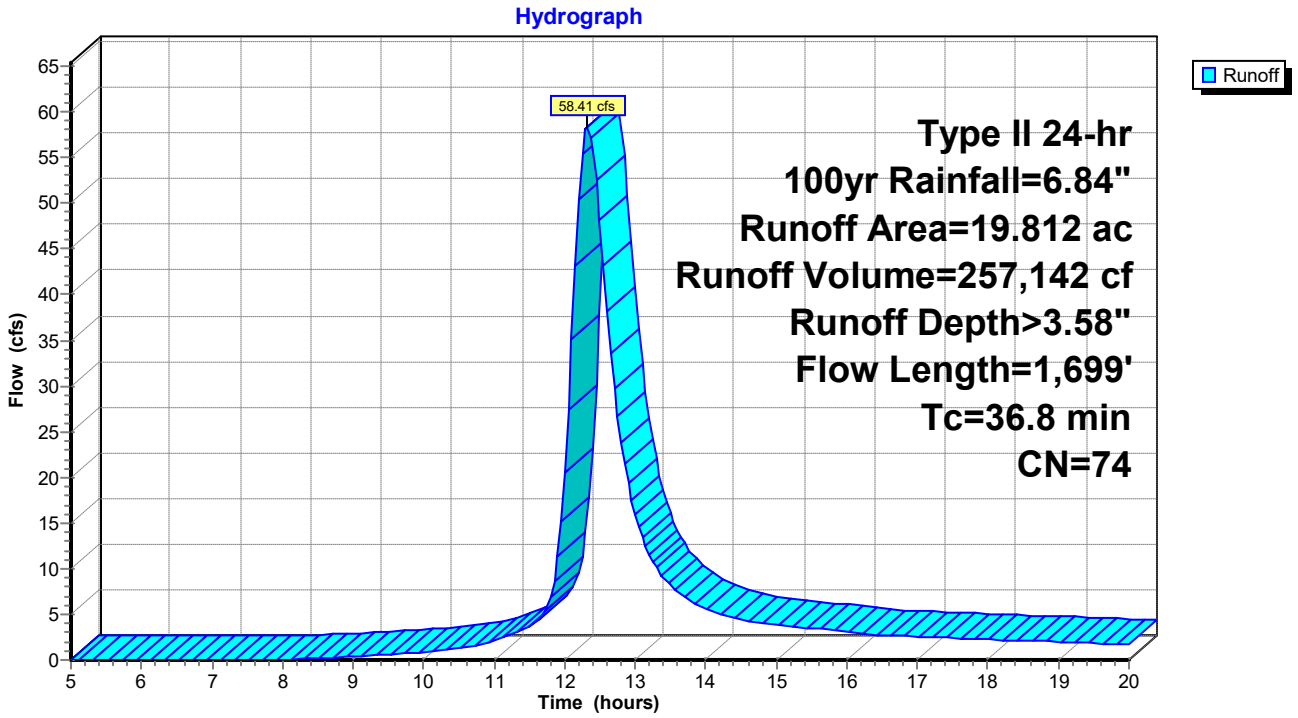
Runoff = 58.41 cfs @ 12.32 hrs, Volume= 257,142 cf, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=6.84"

	Area (ac)	CN	Description
	2.719	73	Woods, Fair, HSG C
	0.707	79	Woods, Fair, HSG D
	4.572	78	Meadow, non-grazed, HSG D
*	11.340	71	Meadow, non-grazed, HSG C
	0.262	89	Gravel roads, HSG C
	0.212	91	Gravel roads, HSG D
	19.812	74	Weighted Average
	19.812		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	78	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
3.6	178	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	625	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0170	2.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
36.8	1,699	Total			

Subcatchment 16S: DA-1



Hydrograph for Subcatchment 16S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.43	0.00	0.00
5.25	0.46	0.00	0.00
5.50	0.49	0.00	0.00
5.75	0.52	0.00	0.00
6.00	0.55	0.00	0.00
6.25	0.58	0.00	0.00
6.50	0.61	0.00	0.00
6.75	0.64	0.00	0.00
7.00	0.68	0.00	0.00
7.25	0.71	0.00	0.00
7.50	0.75	0.00	0.00
7.75	0.78	0.00	0.02
8.00	0.82	0.00	0.06
8.25	0.86	0.01	0.12
8.50	0.90	0.01	0.18
8.75	0.95	0.02	0.27
9.00	1.01	0.02	0.37
9.25	1.06	0.03	0.49
9.50	1.11	0.04	0.62
9.75	1.17	0.06	0.74
10.00	1.24	0.07	0.87
10.25	1.31	0.09	1.06
10.50	1.40	0.11	1.32
10.75	1.49	0.15	1.66
11.00	1.61	0.19	2.11
11.25	1.75	0.24	2.73
11.50	1.94	0.32	3.68
11.75	2.65	0.69	5.80
12.00	4.53	2.00	20.57
12.25	4.83	2.23	**55.50**
12.50	5.03	2.39	**48.17**
12.75	5.17	2.50	26.58
13.00	5.28	2.59	15.91
13.25	5.38	2.67	10.76
13.50	5.47	2.74	8.15
13.75	5.54	2.80	6.65
14.00	5.61	2.86	5.61
14.25	5.67	2.91	4.94
14.50	5.73	2.96	4.44
14.75	5.79	3.01	4.12
15.00	5.84	3.05	3.88
15.25	5.89	3.09	3.67
15.50	5.93	3.13	3.48
15.75	5.98	3.17	3.28
16.00	6.02	3.20	3.09
16.25	6.06	3.23	2.90
16.50	6.10	3.27	2.73
16.75	6.13	3.30	2.62
17.00	6.17	3.33	2.54
17.25	6.20	3.36	2.46
17.50	6.24	3.38	2.39
17.75	6.27	3.41	2.32
18.00	6.30	3.44	2.25
18.25	6.33	3.46	2.18
18.50	6.36	3.49	2.11
18.75	6.39	3.51	2.04
19.00	6.41	3.54	1.97
19.25	6.44	3.56	1.90
19.50	6.47	3.58	1.83
19.75	6.49	3.60	1.76
20.00	**6.51**	**3.62**	1.69

Summary for Subcatchment 17S: DA-1

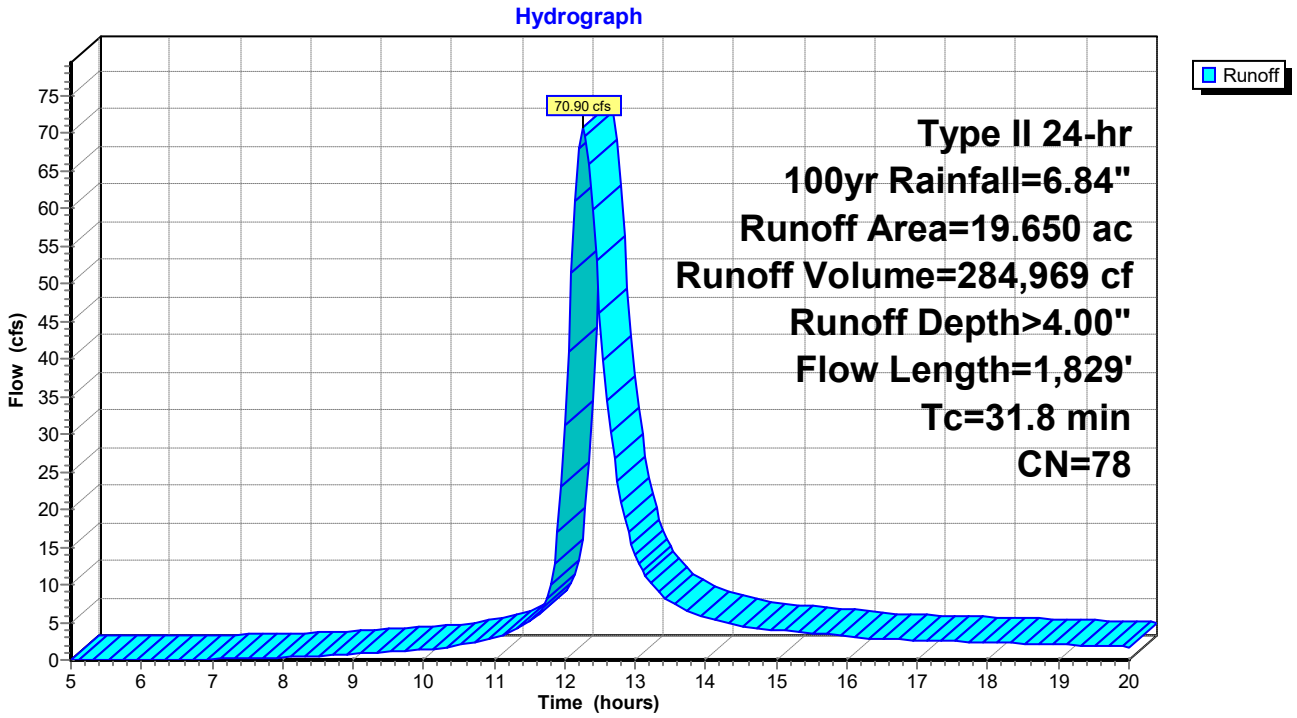
Runoff = 70.90 cfs @ 12.26 hrs, Volume= 284,969 cf, Depth> 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=6.84"

Area (ac)	CN	Description
1.385	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.395	71	Meadow, non-grazed, HSG C
4.315	78	Meadow, non-grazed, HSG D
4.982	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
19.650	78	Weighted Average
19.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	90	0.0770	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
5.6	309	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	20	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	718	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	282	0.0410	2.12	2.12	**Channel Flow, #6** Area= 1.0 sf Perim= 4.5' r= 0.22' n= 0.052
0.2	125	0.0230	9.01	15.93	**Pipe Channel, Culvert #8** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
1.9	245	0.0200	2.14	4.92	**Channel Flow, #4** Area= 2.3 sf Perim= 5.8' r= 0.40' n= 0.053
0.1	40	0.0100	5.94	10.50	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
31.8	1,829	Total			

Subcatchment 17S: DA-1



Hydrograph for Subcatchment 17S: DA-1

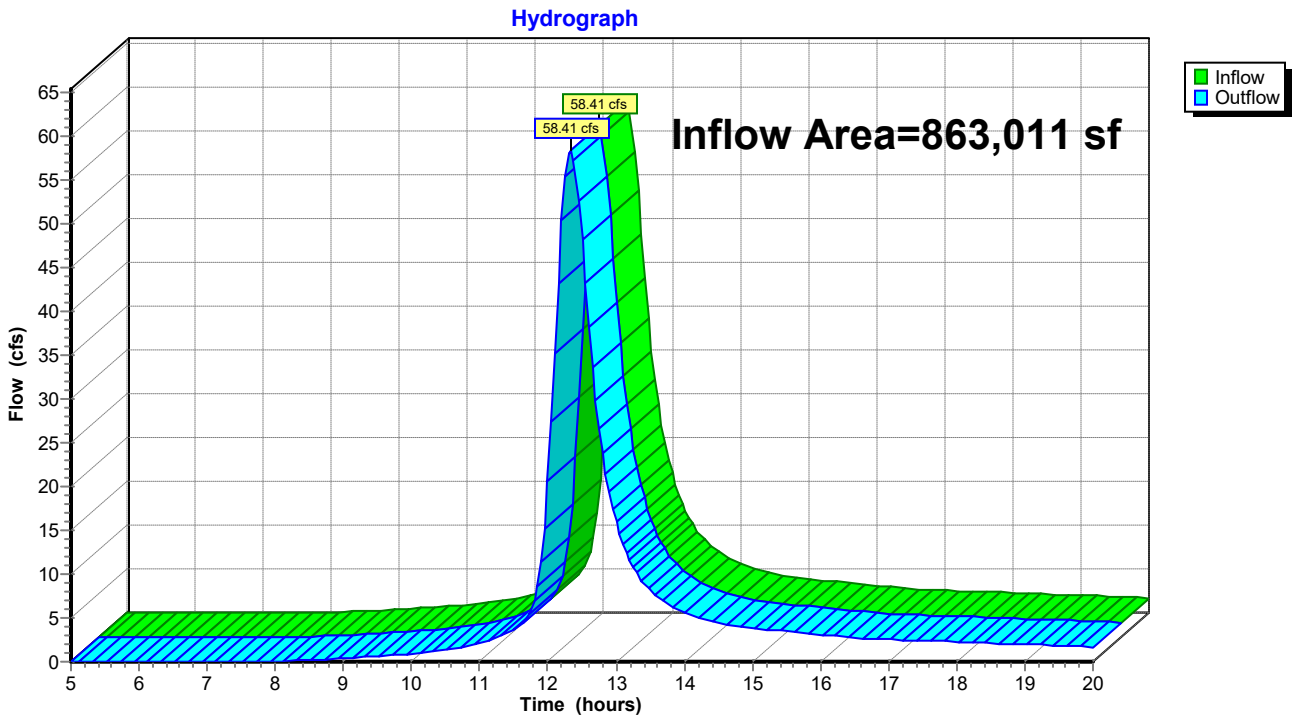
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.43	0.00	0.00
5.25	0.46	0.00	0.00
5.50	0.49	0.00	0.00
5.75	0.52	0.00	0.00
6.00	0.55	0.00	0.00
6.25	0.58	0.00	0.00
6.50	0.61	0.00	0.01
6.75	0.64	0.00	0.04
7.00	0.68	0.00	0.09
7.25	0.71	0.01	0.15
7.50	0.75	0.01	0.21
7.75	0.78	0.02	0.27
8.00	0.82	0.02	0.34
8.25	0.86	0.03	0.41
8.50	0.90	0.04	0.50
8.75	0.95	0.05	0.62
9.00	1.01	0.06	0.76
9.25	1.06	0.07	0.92
9.50	1.11	0.09	1.07
9.75	1.17	0.11	1.20
10.00	1.24	0.13	1.37
10.25	1.31	0.16	1.62
10.50	1.40	0.19	1.96
10.75	1.49	0.23	2.39
11.00	1.61	0.28	2.98
11.25	1.75	0.35	3.77
11.50	1.94	0.45	5.01
11.75	2.65	0.88	8.10
12.00	4.53	2.32	31.18
12.25	4.83	2.57	**70.80**
12.50	5.03	2.73	46.06
12.75	5.17	2.85	23.67
13.00	5.28	2.95	14.01
13.25	5.38	3.04	9.83
13.50	5.47	3.11	7.70
13.75	5.54	3.18	6.41
14.00	5.61	3.24	5.60
14.25	5.67	3.29	4.97
14.50	5.73	3.34	4.50
14.75	5.79	3.39	4.21
15.00	5.84	3.44	3.98
15.25	5.89	3.48	3.77
15.50	5.93	3.52	3.57
15.75	5.98	3.56	3.36
16.00	6.02	3.60	3.16
16.25	6.06	3.63	2.96
16.50	6.10	3.66	2.80
16.75	6.13	3.70	2.69
17.00	6.17	3.73	2.61
17.25	6.20	3.76	2.54
17.50	6.24	3.79	2.46
17.75	6.27	3.82	2.39
18.00	6.30	3.84	2.32
18.25	6.33	3.87	2.25
18.50	6.36	3.90	2.17
18.75	6.39	3.92	2.10
19.00	6.41	3.95	2.02
19.25	6.44	3.97	1.95
19.50	6.47	3.99	1.88
19.75	6.49	4.01	1.80
20.00	**6.51**	**4.03**	1.73

Summary for Reach 4R: Reach

Inflow Area = 863,011 sf, 0.00% Impervious, Inflow Depth > 3.58" for 100yr event
Inflow = 58.41 cfs @ 12.32 hrs, Volume= 257,142 cf
Outflow = 58.41 cfs @ 12.32 hrs, Volume= 257,142 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 4R: Reach



Hydrograph for Reach 4R: Reach

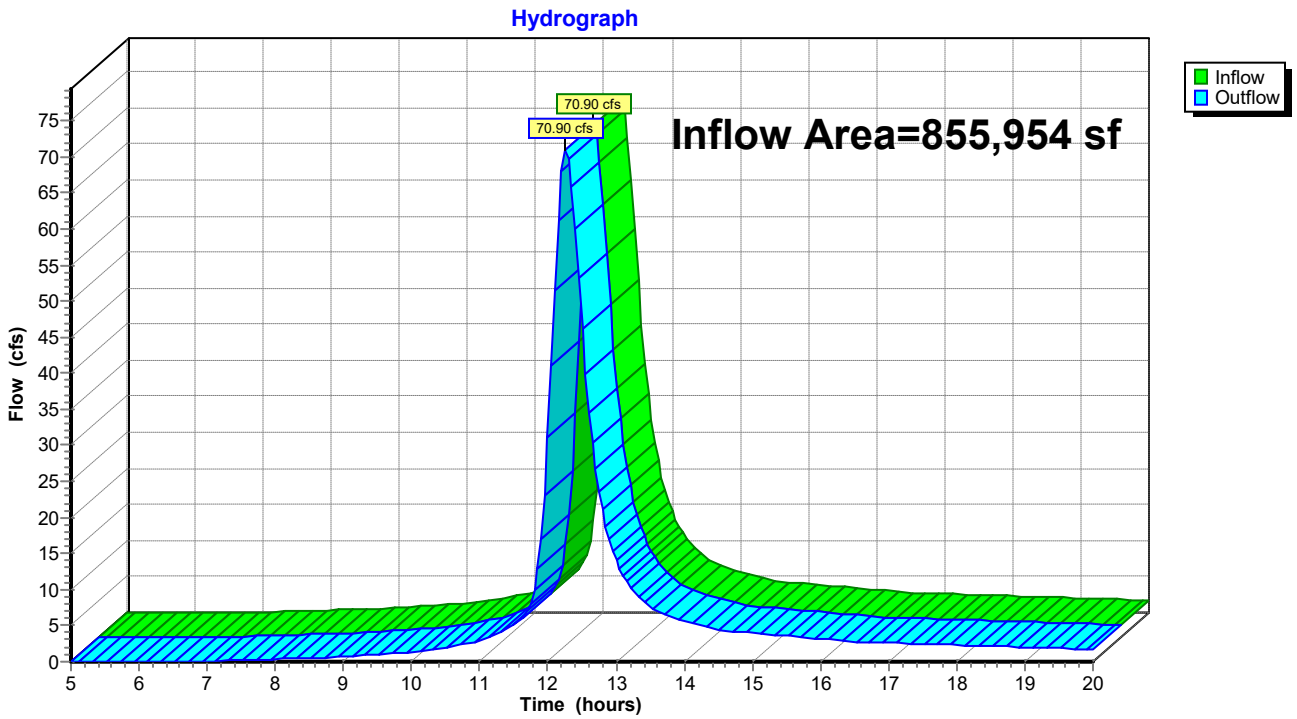
Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	2.32		2.32
5.25	0.00		0.00	18.00	2.25		2.25
5.50	0.00		0.00	18.25	2.18		2.18
5.75	0.00		0.00	18.50	2.11		2.11
6.00	0.00		0.00	18.75	2.04		2.04
6.25	0.00		0.00	19.00	1.97		1.97
6.50	0.00		0.00	19.25	1.90		1.90
6.75	0.00		0.00	19.50	1.83		1.83
7.00	0.00		0.00	19.75	1.76		1.76
7.25	0.00		0.00	20.00	1.69		1.69
7.50	0.00		0.00				
7.75	0.02		0.02				
8.00	0.06		0.06				
8.25	0.12		0.12				
8.50	0.18		0.18				
8.75	0.27		0.27				
9.00	0.37		0.37				
9.25	0.49		0.49				
9.50	0.62		0.62				
9.75	0.74		0.74				
10.00	0.87		0.87				
10.25	1.06		1.06				
10.50	1.32		1.32				
10.75	1.66		1.66				
11.00	2.11		2.11				
11.25	2.73		2.73				
11.50	3.68		3.68				
11.75	5.80		5.80				
12.00	20.57		20.57				
12.25	**55.50**		**55.50**				
12.50	**48.17**		**48.17**				
12.75	26.58		26.58				
13.00	15.91		15.91				
13.25	10.76		10.76				
13.50	8.15		8.15				
13.75	6.65		6.65				
14.00	5.61		5.61				
14.25	4.94		4.94				
14.50	4.44		4.44				
14.75	4.12		4.12				
15.00	3.88		3.88				
15.25	3.67		3.67				
15.50	3.48		3.48				
15.75	3.28		3.28				
16.00	3.09		3.09				
16.25	2.90		2.90				
16.50	2.73		2.73				
16.75	2.62		2.62				
17.00	2.54		2.54				
17.25	2.46		2.46				
17.50	2.39		2.39				

Summary for Reach 5R: Reach

Inflow Area = 855,954 sf, 0.00% Impervious, Inflow Depth > 4.00" for 100yr event
Inflow = 70.90 cfs @ 12.26 hrs, Volume= 284,969 cf
Outflow = 70.90 cfs @ 12.26 hrs, Volume= 284,969 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

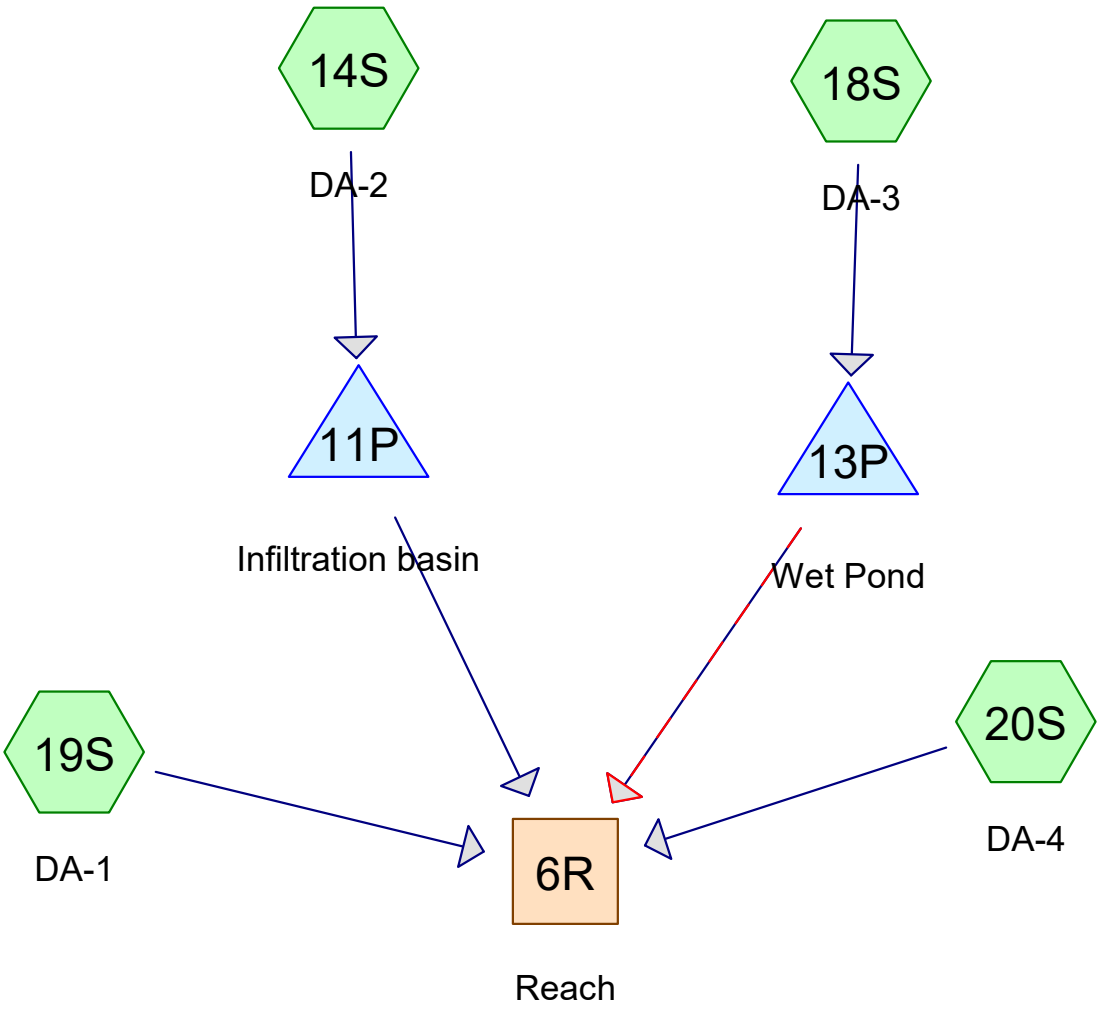
Reach 5R: Reach

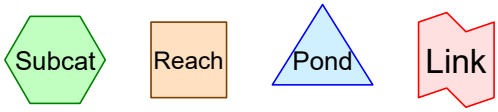


Hydrograph for Reach 5R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	2.39		2.39
5.25	0.00		0.00	18.00	2.32		2.32
5.50	0.00		0.00	18.25	2.25		2.25
5.75	0.00		0.00	18.50	2.17		2.17
6.00	0.00		0.00	18.75	2.10		2.10
6.25	0.00		0.00	19.00	2.02		2.02
6.50	0.01		0.01	19.25	1.95		1.95
6.75	0.04		0.04	19.50	1.88		1.88
7.00	0.09		0.09	19.75	1.80		1.80
7.25	0.15		0.15	20.00	1.73		1.73
7.50	0.21		0.21				
7.75	0.27		0.27				
8.00	0.34		0.34				
8.25	0.41		0.41				
8.50	0.50		0.50				
8.75	0.62		0.62				
9.00	0.76		0.76				
9.25	0.92		0.92				
9.50	1.07		1.07				
9.75	1.20		1.20				
10.00	1.37		1.37				
10.25	1.62		1.62				
10.50	1.96		1.96				
10.75	2.39		2.39				
11.00	2.98		2.98				
11.25	3.77		3.77				
11.50	5.01		5.01				
11.75	8.10		8.10				
12.00	31.18		31.18				
12.25	**70.80**		**70.80**				
12.50	46.06		46.06				
12.75	23.67		23.67				
13.00	14.01		14.01				
13.25	9.83		9.83				
13.50	7.70		7.70				
13.75	6.41		6.41				
14.00	5.60		5.60				
14.25	4.97		4.97				
14.50	4.50		4.50				
14.75	4.21		4.21				
15.00	3.98		3.98				
15.25	3.77		3.77				
15.50	3.57		3.57				
15.75	3.36		3.36				
16.00	3.16		3.16				
16.25	2.96		2.96				
16.50	2.80		2.80				
16.75	2.69		2.69				
17.00	2.61		2.61				
17.25	2.54		2.54				
17.50	2.46		2.46				

Post-development w/BMPs





Routing Diagram for Station 607-all BMPs-12042019_postwBMP
Prepared by {enter your company name here}, Printed 5/20/2020
HydroCAD® 10.00-25 s/n 09710 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.757	89	Gravel roads, HSG C (18S)
0.363	91	Gravel roads, HSG D (18S)
0.545	89	Gravel, HSG C (14S)
10.033	71	Meadow, non-grazed, HSG C (14S, 18S, 19S, 20S)
4.312	78	Meadow, non-grazed, HSG D (20S)
0.427	73	Woods, Fair, HSG C (20S)
0.210	79	Woods, Fair, HSG D (20S)
19.647	**77**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
14.762	HSG C	14S, 18S, 19S, 20S
4.885	HSG D	18S, 20S
0.000	Other	
19.647		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.545	0.000	0.000	0.545	Gravel	14S
0.000	0.000	3.757	0.363	0.000	4.120	Gravel roads	18S
0.000	0.000	10.033	4.312	0.000	14.345	Meadow, non-grazed	14S, 18S, 19S, 20S
0.000	0.000	0.427	0.210	0.000	0.637	Woods, Fair	20S
0.000	**0.000**	**14.762**	**4.885**	**0.000**	**19.647**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	11P	1,276.00	1,272.00	25.0	0.1600	0.012	18.0	0.0	0.0
2	13P	1,289.50	1,289.00	100.0	0.0050	0.013	15.0	0.0	0.0

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 14S: DA-2 Runoff Area=1.770 ac 0.00% Impervious Runoff Depth>0.61"
Flow Length=369' Tc=11.1 min CN=77 Runoff=1.69 cfs 0.090 af

Subcatchment 18S: DA-3 Runoff Area=5.950 ac 0.00% Impervious Runoff Depth>0.96"
Flow Length=1,299' Tc=8.5 min CN=84 Runoff=10.00 cfs 0.474 af

Subcatchment 19S: DA-1 Runoff Area=3.440 ac 0.00% Impervious Runoff Depth>0.39"
Flow Length=1,020' Tc=16.5 min CN=71 Runoff=1.52 cfs 0.112 af

Subcatchment 20S: DA-4 Runoff Area=8.487 ac 0.00% Impervious Runoff Depth>0.53"
Flow Length=1,190' Tc=27.7 min CN=75 Runoff=4.00 cfs 0.373 af

Reach 6R: Reach Inflow=5.11 cfs 0.505 af
Outflow=5.11 cfs 0.505 af

Pond 11P: Infiltration basin Peak Elev=1,276.11' Storage=2,770 cf Inflow=1.69 cfs 0.090 af
Discarded=0.01 cfs 0.008 af Primary=0.05 cfs 0.021 af Outflow=0.06 cfs 0.029 af

Pond 13P: Wet Pond Peak Elev=1,289.37' Storage=20,640 cf Inflow=10.00 cfs 0.474 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 19.647 ac Runoff Volume = 1.049 af Average Runoff Depth = 0.64"
100.00% Pervious = 19.647 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 14S: DA-2

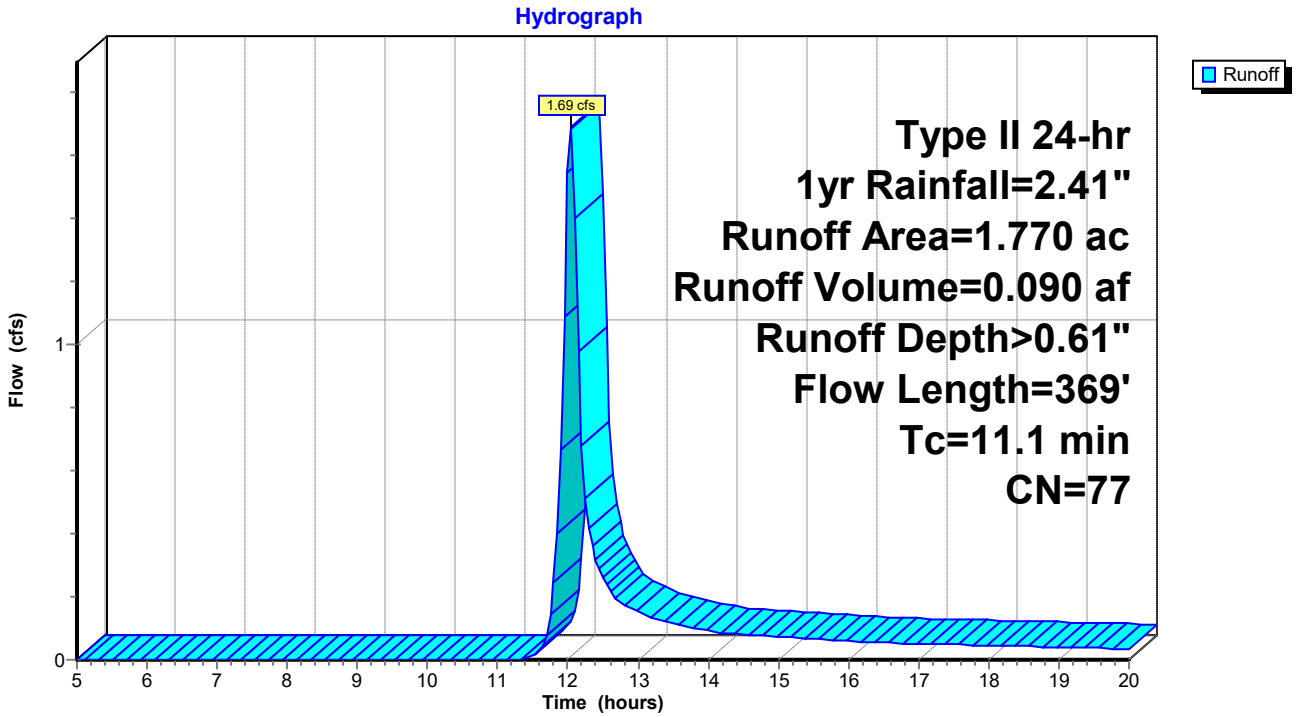
Runoff = 1.69 cfs @ 12.04 hrs, Volume= 0.090 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.41"

	Area (ac)	CN	Description
*	0.545	89	Gravel, HSG C
	1.225	71	Meadow, non-grazed, HSG C
	1.770	77	Weighted Average
	1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	175	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	54	0.0750	1.37		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.1	369	Total			

Subcatchment 14S: DA-2



Hydrograph for Subcatchment 14S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.15	0.00	0.00
5.25	0.16	0.00	0.00
5.50	0.17	0.00	0.00
5.75	0.18	0.00	0.00
6.00	0.19	0.00	0.00
6.25	0.20	0.00	0.00
6.50	0.22	0.00	0.00
6.75	0.23	0.00	0.00
7.00	0.24	0.00	0.00
7.25	0.25	0.00	0.00
7.50	0.26	0.00	0.00
7.75	0.28	0.00	0.00
8.00	0.29	0.00	0.00
8.25	0.30	0.00	0.00
8.50	0.32	0.00	0.00
8.75	0.34	0.00	0.00
9.00	0.35	0.00	0.00
9.25	0.37	0.00	0.00
9.50	0.39	0.00	0.00
9.75	0.41	0.00	0.00
10.00	0.44	0.00	0.00
10.25	0.46	0.00	0.00
10.50	0.49	0.00	0.00
10.75	0.53	0.00	0.00
11.00	0.57	0.00	0.00
11.25	0.62	0.00	0.00
11.50	0.68	0.00	0.01
11.75	0.93	0.03	0.14
12.00	1.60	0.25	**1.54**
12.25	1.70	0.30	**0.51**
12.50	1.77	0.33	0.26
12.75	1.82	0.36	0.18
13.00	1.86	0.38	0.15
13.25	1.90	0.39	0.13
13.50	1.93	0.41	0.12
13.75	1.95	0.42	0.10
14.00	1.98	0.44	0.09
14.25	2.00	0.45	0.08
14.50	2.02	0.46	0.08
14.75	2.04	0.47	0.08
15.00	2.06	0.48	0.07
15.25	2.07	0.49	0.07
15.50	2.09	0.50	0.07
15.75	2.11	0.51	0.06
16.00	2.12	0.51	0.06
16.25	2.13	0.52	0.06
16.50	2.15	0.53	0.05
16.75	2.16	0.54	0.05
17.00	2.17	0.54	0.05
17.25	2.19	0.55	0.05
17.50	2.20	0.56	0.05
17.75	2.21	0.56	0.05
18.00	2.22	0.57	0.05
18.25	2.23	0.58	0.04
18.50	2.24	0.58	0.04
18.75	2.25	0.59	0.04
19.00	2.26	0.59	0.04
19.25	2.27	0.60	0.04
19.50	2.28	0.61	0.04
19.75	2.29	0.61	0.04
20.00	**2.29**	**0.61**	0.03

Summary for Subcatchment 18S: DA-3

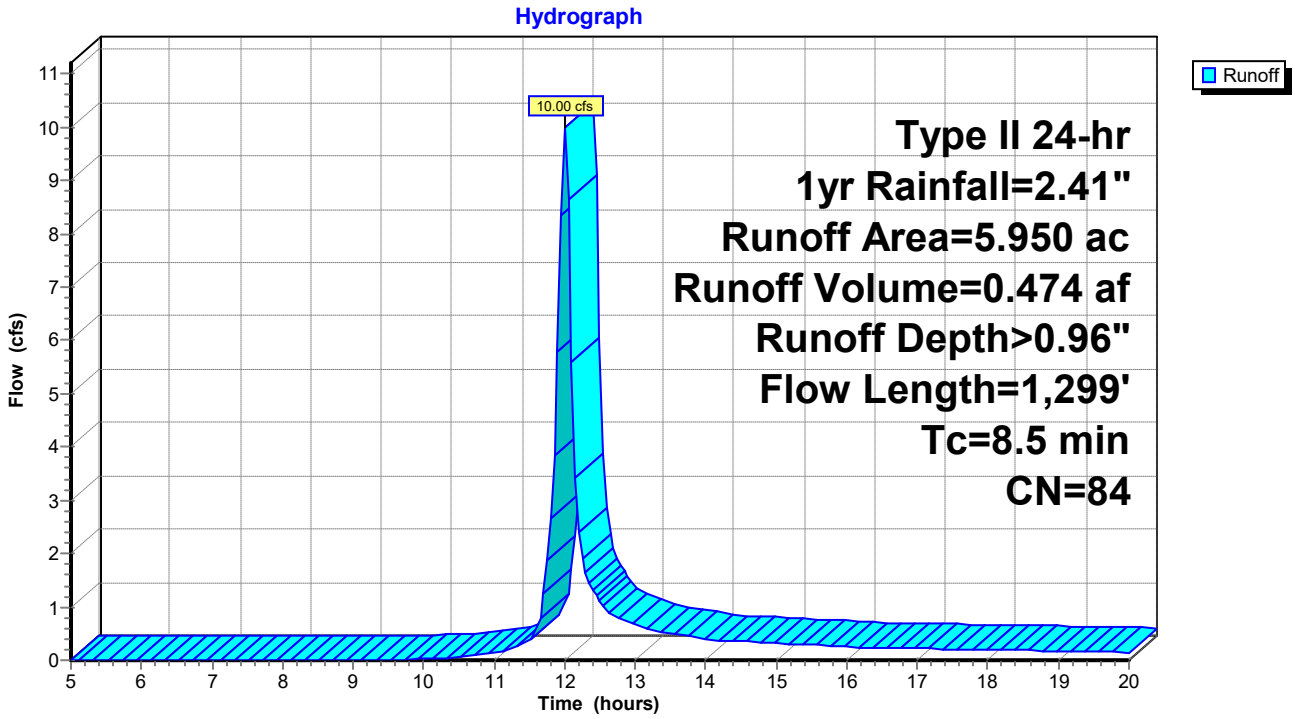
Runoff = 10.00 cfs @ 12.00 hrs, Volume= 0.474 af, Depth> 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.41"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
3.757	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
5.950	84	Weighted Average
5.950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	412	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	330	0.0320	2.28	3.19	**Channel Flow,** Area= 1.4 sf Perim= 5.3' r= 0.26' n= 0.048
2.7	557	0.0200	3.47	10.08	**Channel Flow,** Area= 2.9 sf Perim= 5.6' r= 0.52' n= 0.039
8.5	1,299	Total			

Subcatchment 18S: DA-3



Hydrograph for Subcatchment 18S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.15	0.00	0.00
5.25	0.16	0.00	0.00
5.50	0.17	0.00	0.00
5.75	0.18	0.00	0.00
6.00	0.19	0.00	0.00
6.25	0.20	0.00	0.00
6.50	0.22	0.00	0.00
6.75	0.23	0.00	0.00
7.00	0.24	0.00	0.00
7.25	0.25	0.00	0.00
7.50	0.26	0.00	0.00
7.75	0.28	0.00	0.00
8.00	0.29	0.00	0.00
8.25	0.30	0.00	0.00
8.50	0.32	0.00	0.00
8.75	0.34	0.00	0.00
9.00	0.35	0.00	0.00
9.25	0.37	0.00	0.00
9.50	0.39	0.00	0.00
9.75	0.41	0.00	0.01
10.00	0.44	0.00	0.02
10.25	0.46	0.00	0.04
10.50	0.49	0.01	0.07
10.75	0.53	0.01	0.10
11.00	0.57	0.02	0.15
11.25	0.62	0.03	0.23
11.50	0.68	0.04	0.36
11.75	0.93	0.12	1.88
12.00	1.60	0.47	**10.00**
12.25	1.70	0.54	1.90
12.50	1.77	0.59	1.11
12.75	1.82	0.62	0.79
13.00	1.86	0.65	0.67
13.25	1.90	0.67	0.57
13.50	1.93	0.69	0.51
13.75	1.95	0.71	0.45
14.00	1.98	0.73	0.40
14.25	2.00	0.74	0.37
14.50	2.02	0.76	0.35
14.75	2.04	0.77	0.34
15.00	2.06	0.78	0.32
15.25	2.07	0.80	0.30
15.50	2.09	0.81	0.29
15.75	2.11	0.82	0.27
16.00	2.12	0.83	0.25
16.25	2.13	0.84	0.24
16.50	2.15	0.85	0.23
16.75	2.16	0.86	0.23
17.00	2.17	0.87	0.22
17.25	2.19	0.88	0.21
17.50	2.20	0.89	0.21
17.75	2.21	0.89	0.20
18.00	2.22	0.90	0.20
18.25	2.23	0.91	0.19
18.50	2.24	0.92	0.18
18.75	2.25	0.93	0.18
19.00	2.26	0.93	0.17
19.25	2.27	0.94	0.16
19.50	2.28	0.95	0.16
19.75	2.29	0.95	0.15
20.00	**2.29**	**0.96**	0.14

Summary for Subcatchment 19S: DA-1

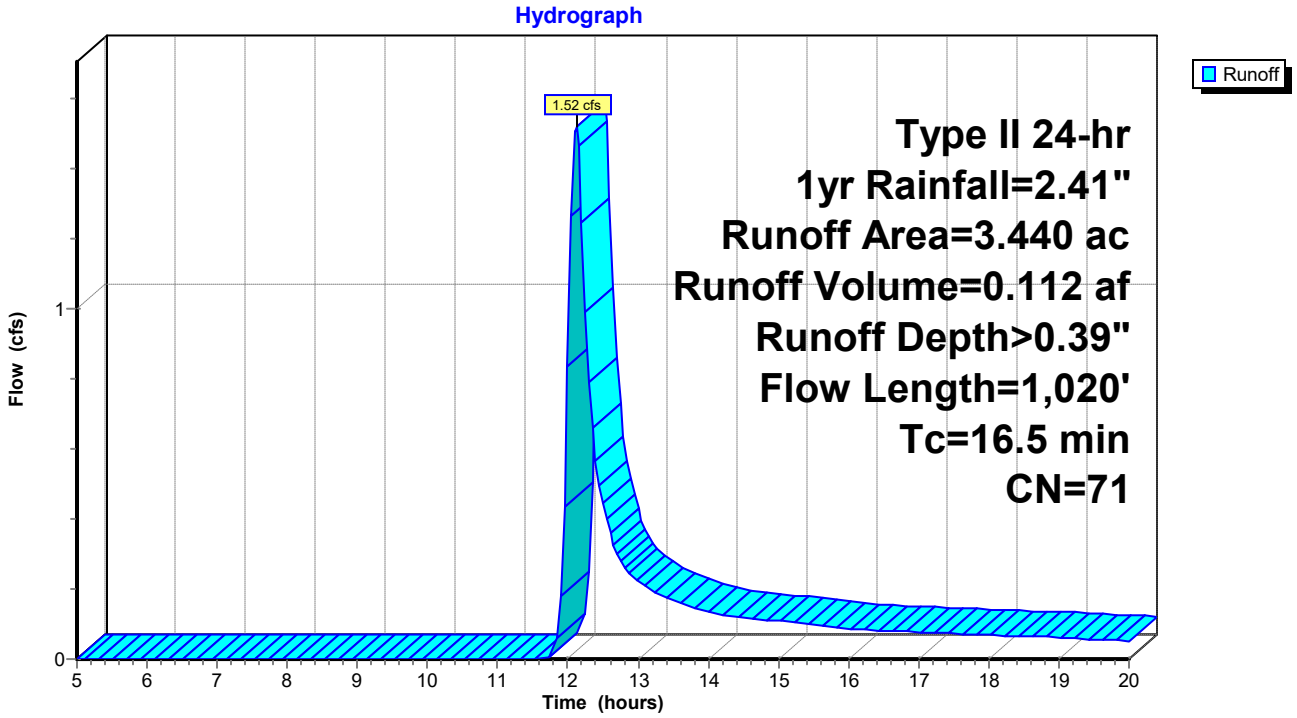
Runoff = 1.52 cfs @ 12.12 hrs, Volume= 0.112 af, Depth> 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.41"

Area (ac)	CN	Description
3.440	71	Meadow, non-grazed, HSG C
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
9.8	920	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.5	1,020	Total			

Subcatchment 19S: DA-1



Hydrograph for Subcatchment 19S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.15	0.00	0.00
5.25	0.16	0.00	0.00
5.50	0.17	0.00	0.00
5.75	0.18	0.00	0.00
6.00	0.19	0.00	0.00
6.25	0.20	0.00	0.00
6.50	0.22	0.00	0.00
6.75	0.23	0.00	0.00
7.00	0.24	0.00	0.00
7.25	0.25	0.00	0.00
7.50	0.26	0.00	0.00
7.75	0.28	0.00	0.00
8.00	0.29	0.00	0.00
8.25	0.30	0.00	0.00
8.50	0.32	0.00	0.00
8.75	0.34	0.00	0.00
9.00	0.35	0.00	0.00
9.25	0.37	0.00	0.00
9.50	0.39	0.00	0.00
9.75	0.41	0.00	0.00
10.00	0.44	0.00	0.00
10.25	0.46	0.00	0.00
10.50	0.49	0.00	0.00
10.75	0.53	0.00	0.00
11.00	0.57	0.00	0.00
11.25	0.62	0.00	0.00
11.50	0.68	0.00	0.00
11.75	0.93	0.00	0.00
12.00	1.60	0.13	**0.83**
12.25	1.70	0.16	**0.99**
12.50	1.77	0.18	0.44
12.75	1.82	0.20	0.28
13.00	1.86	0.21	0.22
13.25	1.90	0.23	0.19
13.50	1.93	0.24	0.17
13.75	1.95	0.25	0.15
14.00	1.98	0.26	0.14
14.25	2.00	0.26	0.12
14.50	2.02	0.27	0.12
14.75	2.04	0.28	0.11
15.00	2.06	0.29	0.11
15.25	2.07	0.30	0.10
15.50	2.09	0.30	0.10
15.75	2.11	0.31	0.09
16.00	2.12	0.32	0.09
16.25	2.13	0.32	0.08
16.50	2.15	0.33	0.08
16.75	2.16	0.33	0.08
17.00	2.17	0.34	0.08
17.25	2.19	0.34	0.07
17.50	2.20	0.35	0.07
17.75	2.21	0.35	0.07
18.00	2.22	0.36	0.07
18.25	2.23	0.36	0.07
18.50	2.24	0.37	0.07
18.75	2.25	0.37	0.06
19.00	2.26	0.38	0.06
19.25	2.27	0.38	0.06
19.50	2.28	0.38	0.06
19.75	2.29	0.39	0.05
20.00	**2.29**	**0.39**	0.05

Summary for Subcatchment 20S: DA-4

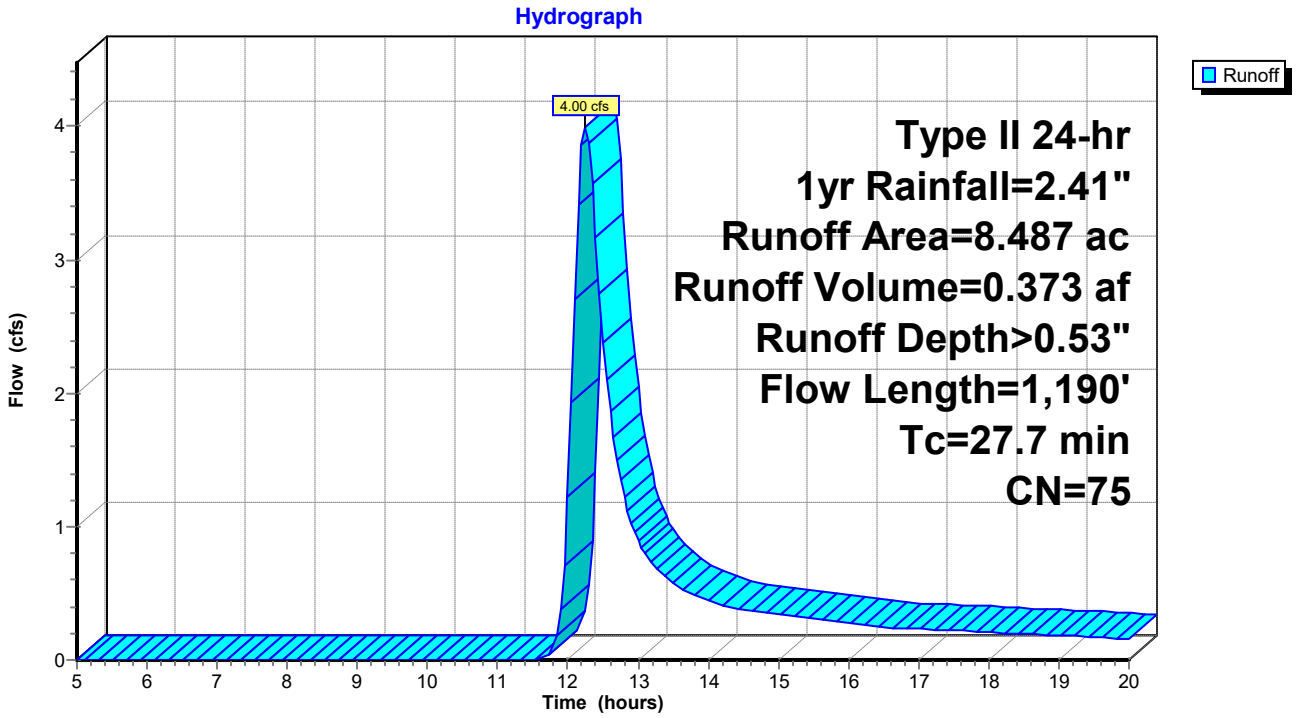
Runoff = 4.00 cfs @ 12.25 hrs, Volume= 0.373 af, Depth> 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.41"

Area (ac)	CN	Description
3.538	71	Meadow, non-grazed, HSG C
4.312	78	Meadow, non-grazed, HSG D
0.427	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.487	75	Weighted Average
8.487		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
4.4	370	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	526	0.0250	1.56	1.87	**Channel Flow,** Area= 1.2 sf Perim= 4.9' r= 0.24' n= 0.059
2.0	194	0.0510	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.7	1,190	Total			

Subcatchment 20S: DA-4



Hydrograph for Subcatchment 20S: DA-4

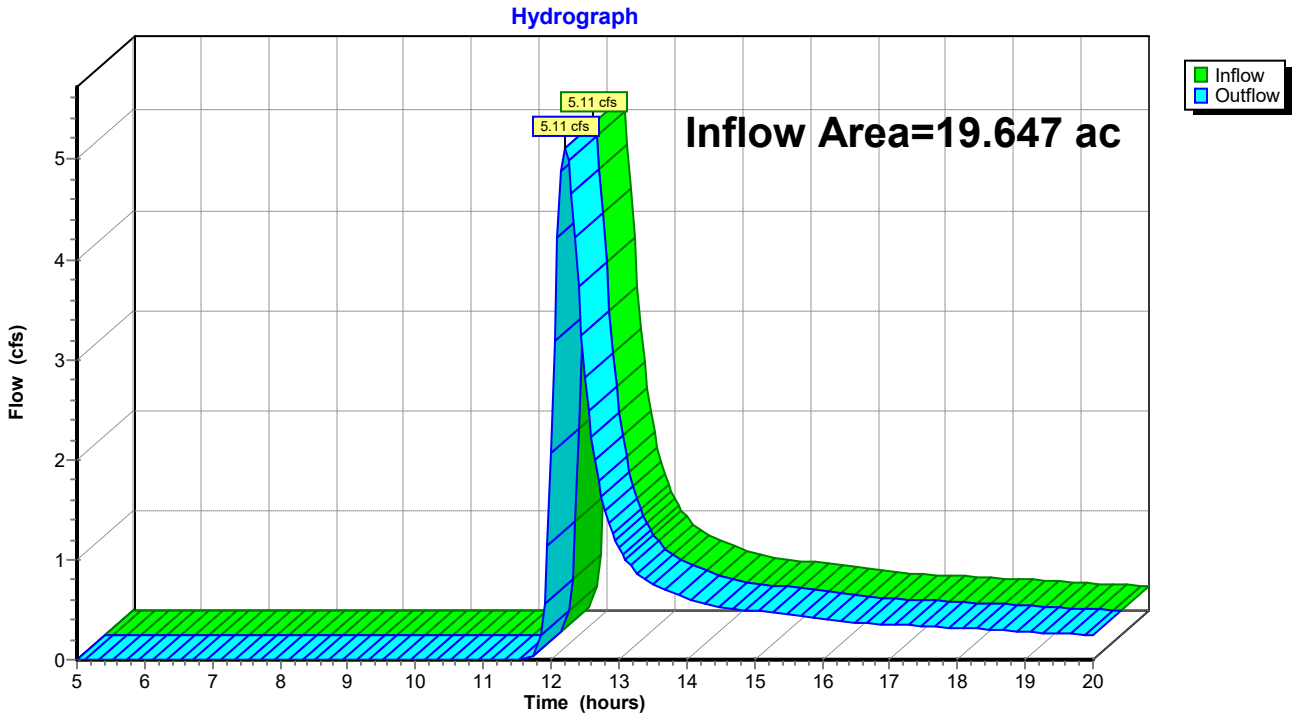
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.15	0.00	0.00
5.25	0.16	0.00	0.00
5.50	0.17	0.00	0.00
5.75	0.18	0.00	0.00
6.00	0.19	0.00	0.00
6.25	0.20	0.00	0.00
6.50	0.22	0.00	0.00
6.75	0.23	0.00	0.00
7.00	0.24	0.00	0.00
7.25	0.25	0.00	0.00
7.50	0.26	0.00	0.00
7.75	0.28	0.00	0.00
8.00	0.29	0.00	0.00
8.25	0.30	0.00	0.00
8.50	0.32	0.00	0.00
8.75	0.34	0.00	0.00
9.00	0.35	0.00	0.00
9.25	0.37	0.00	0.00
9.50	0.39	0.00	0.00
9.75	0.41	0.00	0.00
10.00	0.44	0.00	0.00
10.25	0.46	0.00	0.00
10.50	0.49	0.00	0.00
10.75	0.53	0.00	0.00
11.00	0.57	0.00	0.00
11.25	0.62	0.00	0.00
11.50	0.68	0.00	0.00
11.75	0.93	0.02	0.04
12.00	1.60	0.20	1.23
12.25	1.70	0.25	**4.00**
12.50	1.77	0.27	2.38
12.75	1.82	0.30	1.35
13.00	1.86	0.31	0.89
13.25	1.90	0.33	0.69
13.50	1.93	0.35	0.57
13.75	1.95	0.36	0.51
14.00	1.98	0.37	0.45
14.25	2.00	0.38	0.40
14.50	2.02	0.39	0.37
14.75	2.04	0.40	0.35
15.00	2.06	0.41	0.34
15.25	2.07	0.42	0.32
15.50	2.09	0.43	0.31
15.75	2.11	0.43	0.29
16.00	2.12	0.44	0.27
16.25	2.13	0.45	0.26
16.50	2.15	0.46	0.25
16.75	2.16	0.46	0.24
17.00	2.17	0.47	0.23
17.25	2.19	0.48	0.23
17.50	2.20	0.48	0.22
17.75	2.21	0.49	0.21
18.00	2.22	0.49	0.21
18.25	2.23	0.50	0.20
18.50	2.24	0.50	0.20
18.75	2.25	0.51	0.19
19.00	2.26	0.52	0.18
19.25	2.27	0.52	0.18
19.50	2.28	0.53	0.17
19.75	2.29	0.53	0.16
20.00	**2.29**	**0.53**	0.16

Summary for Reach 6R: Reach

Inflow Area = 19.647 ac, 0.00% Impervious, Inflow Depth > 0.31" for 1yr event
Inflow = 5.11 cfs @ 12.21 hrs, Volume= 0.505 af
Outflow = 5.11 cfs @ 12.21 hrs, Volume= 0.505 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Reach



Hydrograph for Reach 6R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.00		0.00
8.50	0.00		0.00
8.75	0.00		0.00
9.00	0.00		0.00
9.25	0.00		0.00
9.50	0.00		0.00
9.75	0.00		0.00
10.00	0.00		0.00
10.25	0.00		0.00
10.50	0.00		0.00
10.75	0.00		0.00
11.00	0.00		0.00
11.25	0.00		0.00
11.50	0.00		0.00
11.75	0.04		0.04
12.00	**2.06**		**2.06**
12.25	**4.98**		**4.98**
12.50	2.83		2.83
12.75	1.62		1.62
13.00	1.11		1.11
13.25	0.88		0.88
13.50	0.75		0.75
13.75	0.67		0.67
14.00	0.61		0.61
14.25	0.56		0.56
14.50	0.53		0.53
14.75	0.51		0.51
15.00	0.49		0.49
15.25	0.47		0.47
15.50	0.45		0.45
15.75	0.43		0.43
16.00	0.41		0.41
16.25	0.39		0.39
16.50	0.37		0.37
16.75	0.36		0.36
17.00	0.35		0.35
17.25	0.35		0.35
17.50	0.34		0.34
17.75	0.33		0.33
18.00	0.32		0.32
18.25	0.31		0.31
18.50	0.30		0.30
18.75	0.29		0.29
19.00	0.28		0.28
19.25	0.27		0.27
19.50	0.26		0.26
19.75	0.25		0.25
20.00	0.24		0.24

Summary for Pond 11P: Infiltration basin

Inflow Area =	1.770 ac,	0.00% Impervious,	Inflow Depth >	0.61"	for 1yr event
Inflow =	1.69 cfs @	12.04 hrs,	Volume=	0.090 af	
Outflow =	0.06 cfs @	15.80 hrs,	Volume=	0.029 af,	Atten= 96%, Lag= 225.7 min
Discarded =	0.01 cfs @	15.80 hrs,	Volume=	0.008 af	
Primary =	0.05 cfs @	15.80 hrs,	Volume=	0.021 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,276.11' @ 15.80 hrs Surf.Area= 4,199 sf Storage= 2,770 cf

Plug-Flow detention time= 277.4 min calculated for 0.029 af (32% of inflow)
Center-of-Mass det. time= 178.0 min (996.1 - 818.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,275.00'	17,576 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

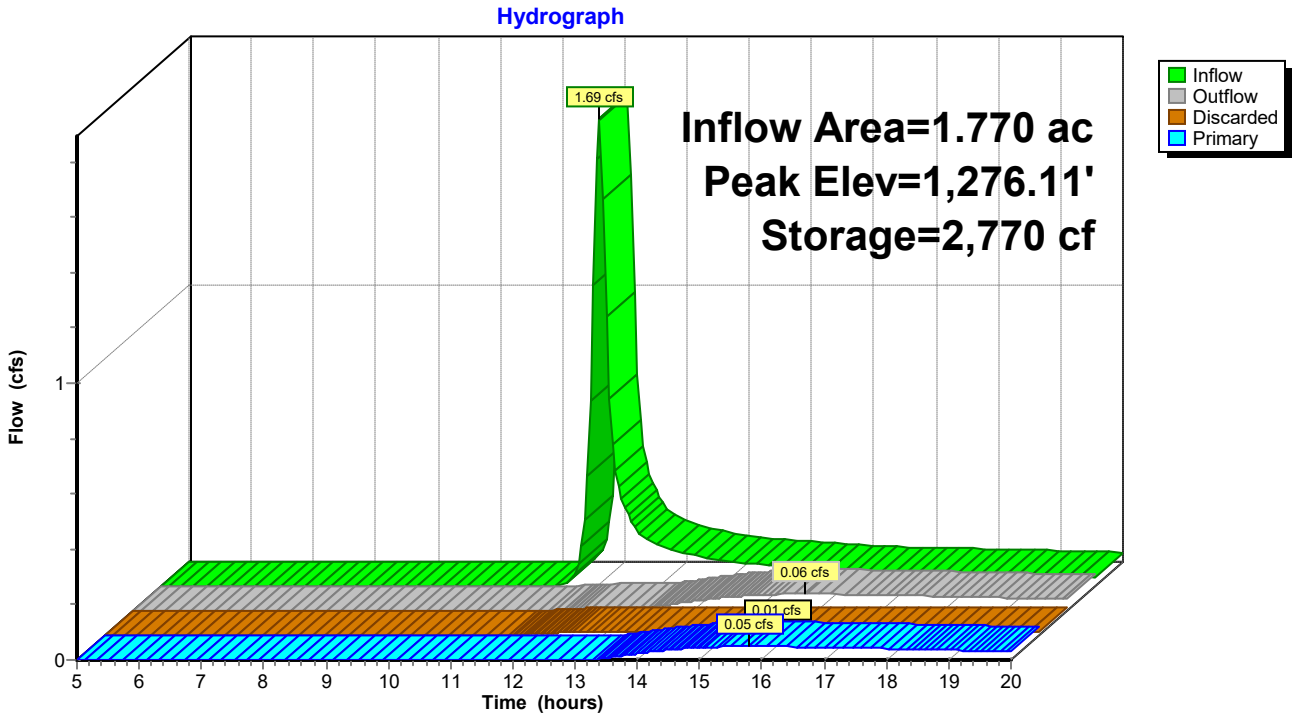
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,275.00	898	0	0
1,276.00	3,791	2,345	2,345
1,278.00	11,440	15,231	17,576

Device	Routing	Invert	Outlet Devices
#1	Primary	1,276.00'	**18.0" Round Pipe** L= 25.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,276.00' / 1,272.00' S= 0.1600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	1,275.00'	**0.125 in/hr Exfiltration over Surface area**
#3	Primary	1,277.00'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

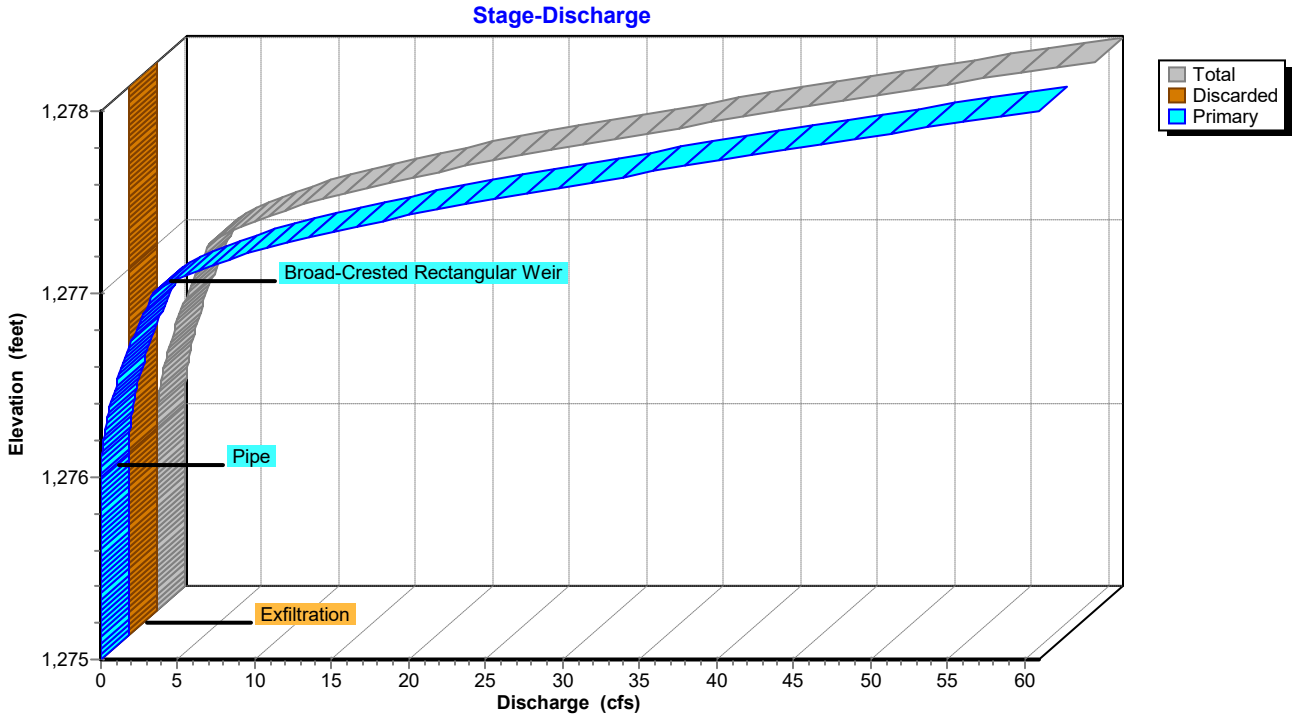
Discarded OutFlow Max=0.01 cfs @ 15.80 hrs HW=1,276.11' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.05 cfs @ 15.80 hrs HW=1,276.11' (Free Discharge)
├─**1=Pipe** (Inlet Controls 0.05 cfs @ 0.88 fps)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: Infiltration basin



Pond 11P: Infiltration basin



Hydrograph for Pond 11P: Infiltration basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.00	0.00	0	1,275.00	0.00	0.00	0.00
5.50	0.00	0	1,275.00	0.00	0.00	0.00
6.00	0.00	0	1,275.00	0.00	0.00	0.00
6.50	0.00	0	1,275.00	0.00	0.00	0.00
7.00	0.00	0	1,275.00	0.00	0.00	0.00
7.50	0.00	0	1,275.00	0.00	0.00	0.00
8.00	0.00	0	1,275.00	0.00	0.00	0.00
8.50	0.00	0	1,275.00	0.00	0.00	0.00
9.00	0.00	0	1,275.00	0.00	0.00	0.00
9.50	0.00	0	1,275.00	0.00	0.00	0.00
10.00	0.00	0	1,275.00	0.00	0.00	0.00
10.50	0.00	0	1,275.00	0.00	0.00	0.00
11.00	0.00	0	1,275.00	0.00	0.00	0.00
11.50	0.01	4	1,275.00	0.00	0.00	0.00
12.00	**1.54**	626	1,275.42	0.01	0.01	0.00
12.50	**0.26**	1,965	1,275.90	0.01	0.01	0.00
13.00	0.15	2,283	1,275.98	0.01	0.01	0.00
13.50	0.12	2,494	1,276.04	0.02	0.01	0.01
14.00	0.09	2,630	1,276.07	0.04	0.01	0.02
14.50	0.08	2,707	1,276.09	0.05	0.01	0.04
15.00	0.07	2,749	1,276.10	0.06	0.01	0.04
15.50	0.07	**2,768**	**1,276.11**	**0.06**	**0.01**	**0.05**
16.00	0.06	**2,769**	**1,276.11**	**0.06**	**0.01**	**0.05**
16.50	0.05	2,761	1,276.10	0.06	0.01	0.05
17.00	0.05	2,750	1,276.10	0.06	0.01	0.05
17.50	0.05	2,739	1,276.10	0.06	0.01	0.04
18.00	0.05	2,727	1,276.10	0.05	0.01	0.04
18.50	0.04	2,714	1,276.09	0.05	0.01	0.04
19.00	0.04	2,701	1,276.09	0.05	0.01	0.04
19.50	0.04	2,688	1,276.09	0.04	0.01	0.03
20.00	0.03	2,673	1,276.08	0.04	0.01	0.03

Stage-Discharge for Pond 11P: Infiltration basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
1,275.00	0.00	0.00	0.00
1,275.05	0.00	0.00	0.00
1,275.10	0.00	0.00	0.00
1,275.15	0.00	0.00	0.00
1,275.20	0.00	0.00	0.00
1,275.25	0.00	0.00	0.00
1,275.30	0.01	0.01	0.00
1,275.35	0.01	0.01	0.00
1,275.40	0.01	0.01	0.00
1,275.45	0.01	0.01	0.00
1,275.50	0.01	0.01	0.00
1,275.55	0.01	0.01	0.00
1,275.60	0.01	0.01	0.00
1,275.65	0.01	0.01	0.00
1,275.70	0.01	0.01	0.00
1,275.75	0.01	0.01	0.00
1,275.80	0.01	0.01	0.00
1,275.85	0.01	0.01	0.00
1,275.90	0.01	0.01	0.00
1,275.95	0.01	0.01	0.00
1,276.00	0.01	0.01	0.00
1,276.05	0.02	0.01	0.01
1,276.10	0.06	0.01	0.04
1,276.15	0.11	0.01	0.10
1,276.20	0.18	0.01	0.17
1,276.25	0.27	0.01	0.26
1,276.30	0.38	0.01	0.37
1,276.35	0.51	0.01	0.50
1,276.40	0.66	0.02	0.64
1,276.45	0.82	0.02	0.80
1,276.50	1.00	0.02	0.98
1,276.55	1.19	0.02	1.17
1,276.60	1.39	0.02	1.37
1,276.65	1.61	0.02	1.59
1,276.70	1.84	0.02	1.82
1,276.75	2.08	0.02	2.06
1,276.80	2.32	0.02	2.30
1,276.85	2.58	0.02	2.56
1,276.90	2.84	0.02	2.82
1,276.95	3.11	0.02	3.09
1,277.00	3.39	0.02	3.36
1,277.05	4.19	0.02	4.17
1,277.10	5.44	0.02	5.42
1,277.15	6.98	0.02	6.96
1,277.20	8.74	0.02	8.72
1,277.25	10.80	0.02	10.78
1,277.30	13.10	0.03	13.07
1,277.35	15.61	0.03	15.58
1,277.40	18.34	0.03	18.31
1,277.45	21.25	0.03	21.22
1,277.50	24.34	0.03	24.31
1,277.55	27.68	0.03	27.65
1,277.60	31.23	0.03	31.20
1,277.65	34.57	0.03	34.54
1,277.70	38.03	0.03	38.00
1,277.75	41.59	0.03	41.56
1,277.80	45.27	0.03	45.24
1,277.85	49.04	0.03	49.01
1,277.90	52.91	0.03	52.88
1,277.95	56.88	0.03	56.85
1,278.00	**60.94**	**0.03**	**60.91**

Stage-Area-Storage for Pond 11P: Infiltration basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,275.00	898	0
1,275.05	1,043	49
1,275.10	1,187	104
1,275.15	1,332	167
1,275.20	1,477	237
1,275.25	1,621	315
1,275.30	1,766	400
1,275.35	1,911	491
1,275.40	2,055	591
1,275.45	2,200	697
1,275.50	2,345	811
1,275.55	2,489	931
1,275.60	2,634	1,060
1,275.65	2,778	1,195
1,275.70	2,923	1,337
1,275.75	3,068	1,487
1,275.80	3,212	1,644
1,275.85	3,357	1,808
1,275.90	3,502	1,980
1,275.95	3,646	2,159
1,276.00	3,791	2,345
1,276.05	3,982	2,539
1,276.10	4,173	2,743
1,276.15	4,365	2,956
1,276.20	4,556	3,179
1,276.25	4,747	3,412
1,276.30	4,938	3,654
1,276.35	5,130	3,906
1,276.40	5,321	4,167
1,276.45	5,512	4,438
1,276.50	5,703	4,718
1,276.55	5,894	5,008
1,276.60	6,086	5,308
1,276.65	6,277	5,617
1,276.70	6,468	5,935
1,276.75	6,659	6,263
1,276.80	6,851	6,601
1,276.85	7,042	6,948
1,276.90	7,233	7,305
1,276.95	7,424	7,672
1,277.00	7,616	8,048
1,277.05	7,807	8,433
1,277.10	7,998	8,828
1,277.15	8,189	9,233
1,277.20	8,380	9,647
1,277.25	8,572	10,071
1,277.30	8,763	10,505
1,277.35	8,954	10,947
1,277.40	9,145	11,400
1,277.45	9,337	11,862
1,277.50	9,528	12,334
1,277.55	9,719	12,815
1,277.60	9,910	13,305
1,277.65	10,101	13,806
1,277.70	10,293	14,316
1,277.75	10,484	14,835
1,277.80	10,675	15,364
1,277.85	10,866	15,903
1,277.90	11,058	16,451
1,277.95	11,249	17,008
1,278.00	**11,440**	**17,576**

Summary for Pond 13P: Wet Pond

Inflow Area = 5.950 ac, 0.00% Impervious, Inflow Depth > 0.96" for 1yr event
Inflow = 10.00 cfs @ 12.00 hrs, Volume= 0.474 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,289.37' @ 20.00 hrs Surf.Area= 25,161 sf Storage= 20,640 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,288.50'	214,237 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

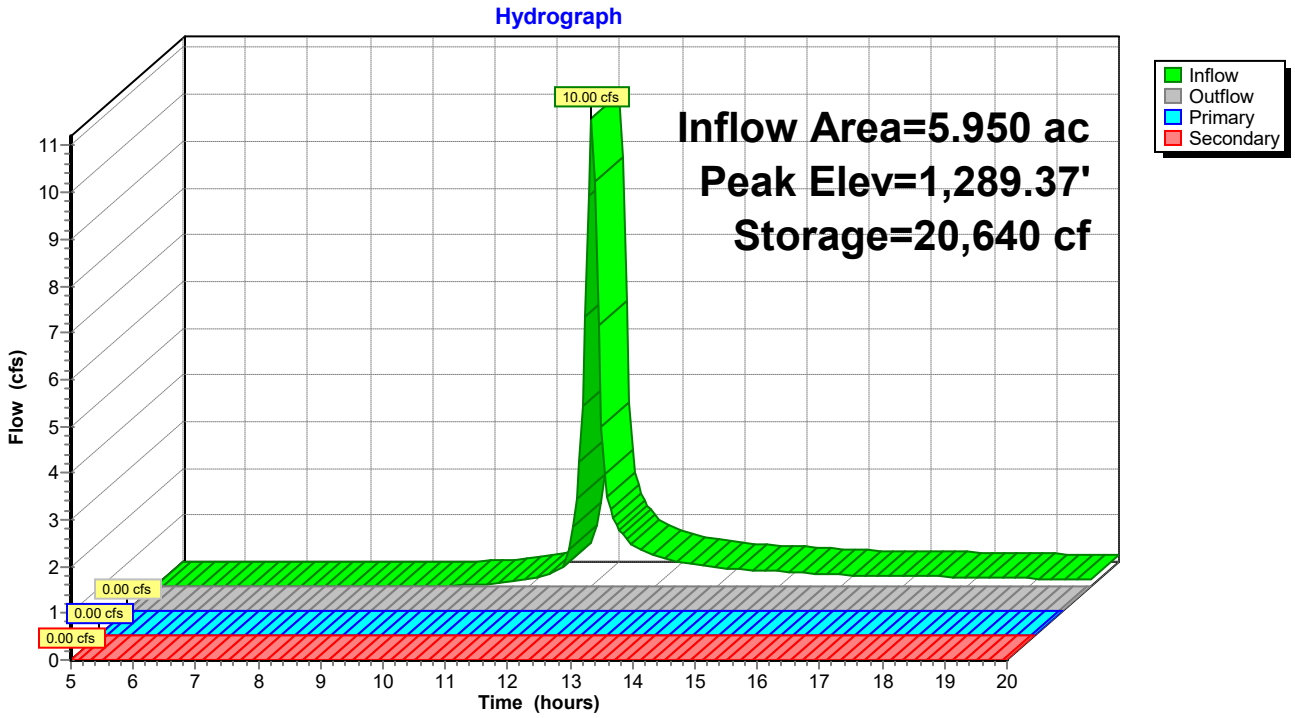
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,288.50	22,471	0	0
1,290.00	27,127	37,199	37,199
1,292.00	33,940	61,067	98,266
1,294.00	40,276	74,216	172,482
1,295.00	43,234	41,755	214,237

Device	Routing	Invert	Outlet Devices
#1	Primary	1,289.50'	**15.0" Round Pipe** L= 100.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,289.50' / 1,289.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,290.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,291.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1,292.00'	**1.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	1,293.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

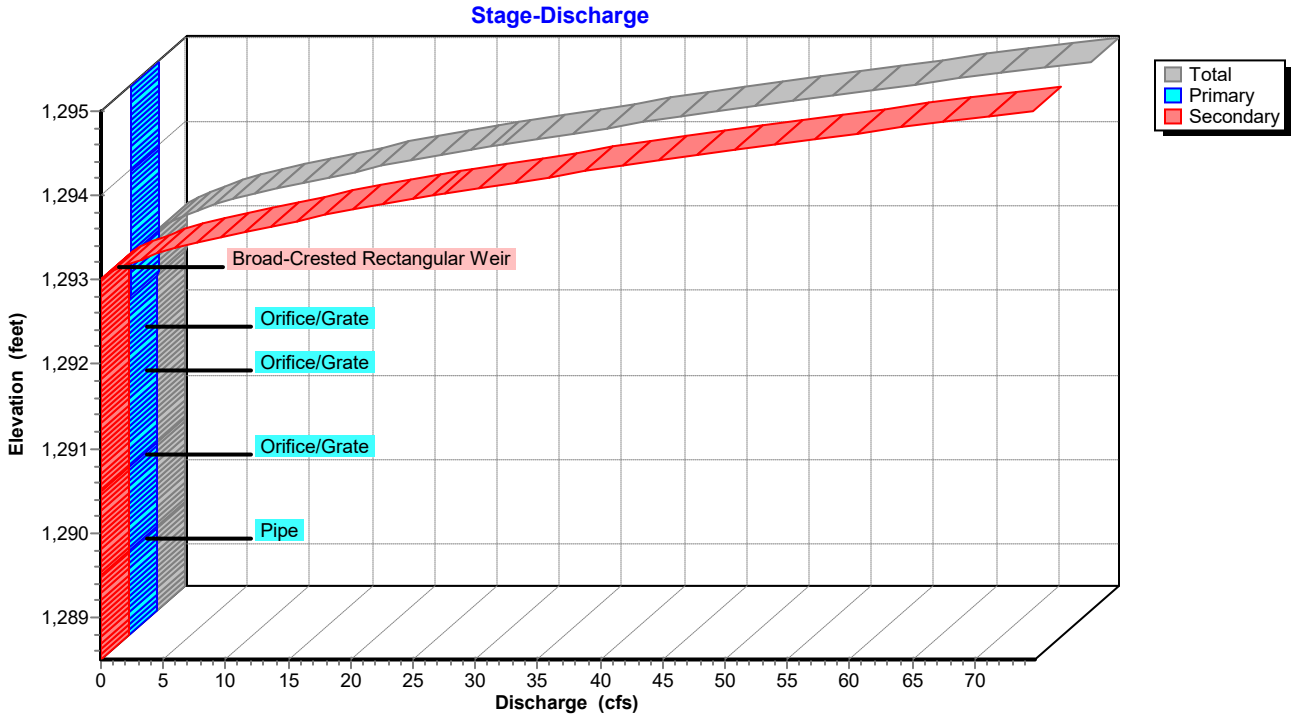
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**1=Pipe** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 13P: Wet Pond



Pond 13P: Wet Pond



Hydrograph for Pond 13P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.00	0.00	0	1,288.50	**0.00**	**0.00**	**0.00**
5.50	0.00	0	1,288.50	0.00	0.00	0.00
6.00	0.00	0	1,288.50	0.00	0.00	0.00
6.50	0.00	0	1,288.50	0.00	0.00	0.00
7.00	0.00	0	1,288.50	0.00	0.00	0.00
7.50	0.00	0	1,288.50	0.00	0.00	0.00
8.00	0.00	0	1,288.50	0.00	0.00	0.00
8.50	0.00	0	1,288.50	0.00	0.00	0.00
9.00	0.00	0	1,288.50	0.00	0.00	0.00
9.50	0.00	0	1,288.50	0.00	0.00	0.00
10.00	0.02	21	1,288.50	0.00	0.00	0.00
10.50	0.07	98	1,288.50	0.00	0.00	0.00
11.00	0.15	281	1,288.51	0.00	0.00	0.00
11.50	0.36	704	1,288.53	0.00	0.00	0.00
12.00	**10.00**	6,227	1,288.77	0.00	0.00	0.00
12.50	1.11	12,192	1,289.02	0.00	0.00	0.00
13.00	0.67	13,667	1,289.08	0.00	0.00	0.00
13.50	0.51	14,706	1,289.13	0.00	0.00	0.00
14.00	0.40	15,518	1,289.16	0.00	0.00	0.00
14.50	0.35	16,188	1,289.19	0.00	0.00	0.00
15.00	0.32	16,793	1,289.21	0.00	0.00	0.00
15.50	0.29	17,338	1,289.23	0.00	0.00	0.00
16.00	0.25	17,822	1,289.25	0.00	0.00	0.00
16.50	0.23	18,254	1,289.27	0.00	0.00	0.00
17.00	0.22	18,662	1,289.29	0.00	0.00	0.00
17.50	0.21	19,049	1,289.30	0.00	0.00	0.00
18.00	0.20	19,413	1,289.32	0.00	0.00	0.00
18.50	0.18	19,755	1,289.33	0.00	0.00	0.00
19.00	0.17	20,074	1,289.34	0.00	0.00	0.00
19.50	0.16	20,370	1,289.36	0.00	0.00	0.00
20.00	0.14	**20,642**	**1,289.37**	0.00	0.00	0.00

Stage-Discharge for Pond 13P: Wet Pond

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
1,288.50	0.00	0.00	0.00
1,288.60	0.00	0.00	0.00
1,288.70	0.00	0.00	0.00
1,288.80	0.00	0.00	0.00
1,288.90	0.00	0.00	0.00
1,289.00	0.00	0.00	0.00
1,289.10	0.00	0.00	0.00
1,289.20	0.00	0.00	0.00
1,289.30	0.00	0.00	0.00
1,289.40	0.00	0.00	0.00
1,289.50	0.00	0.00	0.00
1,289.60	0.00	0.00	0.00
1,289.70	0.00	0.00	0.00
1,289.80	0.00	0.00	0.00
1,289.90	0.00	0.00	0.00
1,290.00	0.00	0.00	0.00
1,290.10	0.00	0.00	0.00
1,290.20	0.00	0.00	0.00
1,290.30	0.00	0.00	0.00
1,290.40	0.00	0.00	0.00
1,290.50	0.00	0.00	0.00
1,290.60	0.01	0.01	0.00
1,290.70	0.01	0.01	0.00
1,290.80	0.01	0.01	0.00
1,290.90	0.02	0.02	0.00
1,291.00	0.02	0.02	0.00
1,291.10	0.02	0.02	0.00
1,291.20	0.02	0.02	0.00
1,291.30	0.02	0.02	0.00
1,291.40	0.02	0.02	0.00
1,291.50	0.03	0.03	0.00
1,291.60	0.03	0.03	0.00
1,291.70	0.04	0.04	0.00
1,291.80	0.04	0.04	0.00
1,291.90	0.05	0.05	0.00
1,292.00	0.05	0.05	0.00
1,292.10	0.06	0.06	0.00
1,292.20	0.07	0.07	0.00
1,292.30	0.07	0.07	0.00
1,292.40	0.08	0.08	0.00
1,292.50	0.08	0.08	0.00
1,292.60	0.08	0.08	0.00
1,292.70	0.09	0.09	0.00
1,292.80	0.09	0.09	0.00
1,292.90	0.10	0.10	0.00
1,293.00	0.10	0.10	0.00
1,293.10	0.91	0.10	0.81
1,293.20	2.40	0.10	2.30
1,293.30	4.37	0.11	4.26
1,293.40	6.74	0.11	6.63
1,293.50	9.52	0.11	9.40
1,293.60	12.66	0.12	12.55
1,293.70	15.84	0.12	15.73
1,293.80	19.23	0.12	19.10
1,293.90	22.88	0.12	22.75
1,294.00	26.73	0.13	26.60
1,294.10	30.88	0.13	30.75
1,294.20	35.23	0.13	35.10
1,294.30	39.64	0.13	39.50
1,294.40	44.20	0.14	44.06
1,294.50	48.82	0.14	48.68
1,294.60	53.57	0.14	53.43
1,294.70	58.66	0.14	58.52
1,294.80	63.90	0.15	63.75
1,294.90	69.29	0.15	69.14
1,295.00	**74.82**	**0.15**	**74.67**

Stage-Area-Storage for Pond 13P: Wet Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,288.50	22,471	0
1,288.60	22,781	2,263
1,288.70	23,092	4,556
1,288.80	23,402	6,881
1,288.90	23,713	9,237
1,289.00	24,023	11,624
1,289.10	24,333	14,041
1,289.20	24,644	16,490
1,289.30	24,954	18,970
1,289.40	25,265	21,481
1,289.50	25,575	24,023
1,289.60	25,885	26,596
1,289.70	26,196	29,200
1,289.80	26,506	31,835
1,289.90	26,817	34,501
1,290.00	27,127	37,199
1,290.10	27,468	39,928
1,290.20	27,808	42,692
1,290.30	28,149	45,490
1,290.40	28,490	48,322
1,290.50	28,830	51,188
1,290.60	29,171	54,088
1,290.70	29,512	57,022
1,290.80	29,852	59,990
1,290.90	30,193	62,992
1,291.00	30,534	66,029
1,291.10	30,874	69,099
1,291.20	31,215	72,204
1,291.30	31,555	75,342
1,291.40	31,896	78,515
1,291.50	32,237	81,721
1,291.60	32,577	84,962
1,291.70	32,918	88,237
1,291.80	33,259	91,546
1,291.90	33,599	94,889
1,292.00	33,940	98,266
1,292.10	34,257	101,675
1,292.20	34,574	105,117
1,292.30	34,890	108,590
1,292.40	35,207	112,095
1,292.50	35,524	115,632
1,292.60	35,841	119,200
1,292.70	36,158	122,800
1,292.80	36,474	126,431
1,292.90	36,791	130,095
1,293.00	37,108	133,790
1,293.10	37,425	137,516
1,293.20	37,742	141,274
1,293.30	38,058	145,064
1,293.40	38,375	148,886
1,293.50	38,692	152,740
1,293.60	39,009	156,625
1,293.70	39,326	160,541
1,293.80	39,642	164,490
1,293.90	39,959	168,470
1,294.00	40,276	172,482
1,294.10	40,572	176,524
1,294.20	40,868	180,596
1,294.30	41,163	184,697
1,294.40	41,459	188,829
1,294.50	41,755	192,989
1,294.60	42,051	197,180
1,294.70	42,347	201,399
1,294.80	42,642	205,649
1,294.90	42,938	209,928
1,295.00	**43,234**	**214,237**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 14S: DA-2 Runoff Area=1.770 ac 0.00% Impervious Runoff Depth>0.89"
Flow Length=369' Tc=11.1 min CN=77 Runoff=2.51 cfs 0.132 af

Subcatchment 18S: DA-3 Runoff Area=5.950 ac 0.00% Impervious Runoff Depth>1.30"
Flow Length=1,299' Tc=8.5 min CN=84 Runoff=13.56 cfs 0.646 af

Subcatchment 19S: DA-1 Runoff Area=3.440 ac 0.00% Impervious Runoff Depth>0.61"
Flow Length=1,020' Tc=16.5 min CN=71 Runoff=2.60 cfs 0.175 af

Subcatchment 20S: DA-4 Runoff Area=8.487 ac 0.00% Impervious Runoff Depth>0.79"
Flow Length=1,190' Tc=27.7 min CN=75 Runoff=6.29 cfs 0.556 af

Reach 6R: Reach Inflow=8.22 cfs 0.792 af
Outflow=8.22 cfs 0.792 af

Pond 11P: Infiltration basin Peak Elev=1,276.20' Storage=3,184 cf Inflow=2.51 cfs 0.132 af
Discarded=0.01 cfs 0.009 af Primary=0.17 cfs 0.060 af Outflow=0.18 cfs 0.069 af

Pond 13P: Wet Pond Peak Elev=1,289.66' Storage=28,133 cf Inflow=13.56 cfs 0.646 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 19.647 ac Runoff Volume = 1.509 af Average Runoff Depth = 0.92"
100.00% Pervious = 19.647 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 14S: DA-2

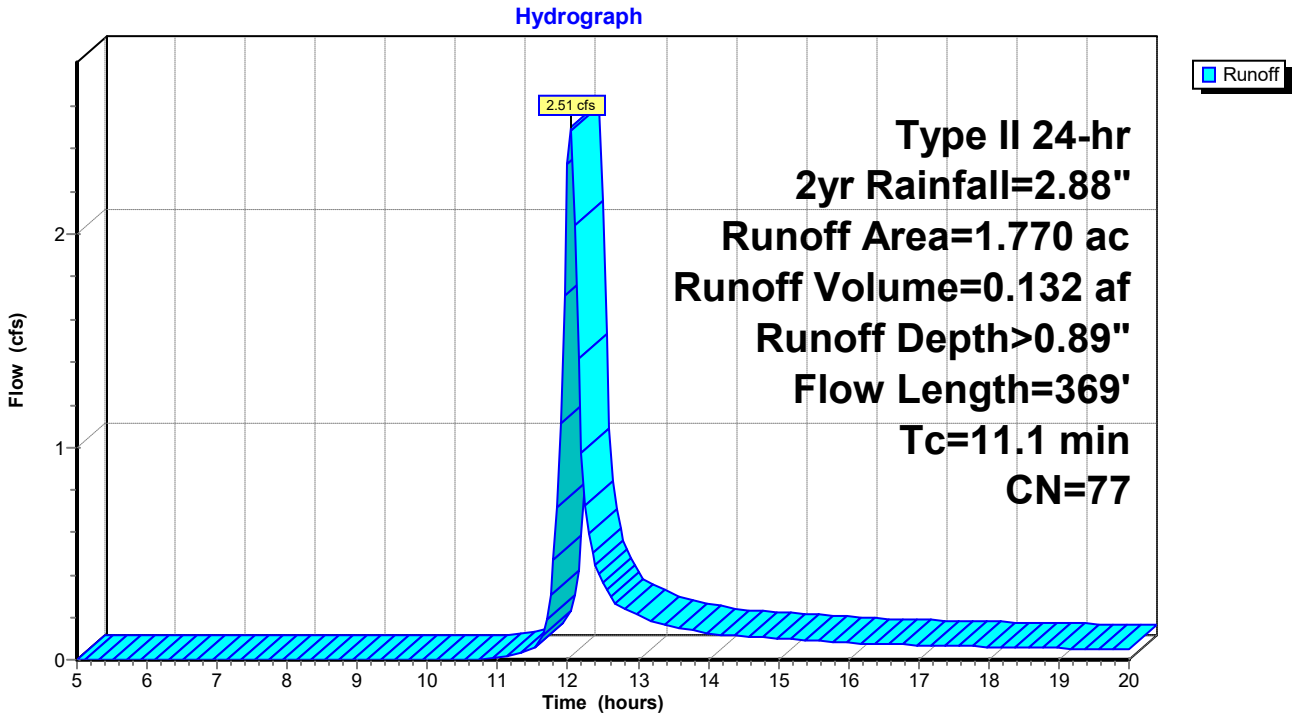
Runoff = 2.51 cfs @ 12.04 hrs, Volume= 0.132 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.88"

	Area (ac)	CN	Description
*	0.545	89	Gravel, HSG C
	1.225	71	Meadow, non-grazed, HSG C
	1.770	77	Weighted Average
	1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	175	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	54	0.0750	1.37		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.1	369	Total			

Subcatchment 14S: DA-2



Hydrograph for Subcatchment 14S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.18	0.00	0.00
5.25	0.19	0.00	0.00
5.50	0.21	0.00	0.00
5.75	0.22	0.00	0.00
6.00	0.23	0.00	0.00
6.25	0.24	0.00	0.00
6.50	0.26	0.00	0.00
6.75	0.27	0.00	0.00
7.00	0.29	0.00	0.00
7.25	0.30	0.00	0.00
7.50	0.31	0.00	0.00
7.75	0.33	0.00	0.00
8.00	0.35	0.00	0.00
8.25	0.36	0.00	0.00
8.50	0.38	0.00	0.00
8.75	0.40	0.00	0.00
9.00	0.42	0.00	0.00
9.25	0.45	0.00	0.00
9.50	0.47	0.00	0.00
9.75	0.49	0.00	0.00
10.00	0.52	0.00	0.00
10.25	0.55	0.00	0.00
10.50	0.59	0.00	0.00
10.75	0.63	0.00	0.00
11.00	0.68	0.00	0.01
11.25	0.74	0.01	0.03
11.50	0.82	0.01	0.05
11.75	1.11	0.08	0.31
12.00	1.91	0.40	**2.33**
12.25	2.03	0.47	**0.73**
12.50	2.12	0.51	0.36
12.75	2.17	0.55	0.25
13.00	2.22	0.57	0.21
13.25	2.26	0.60	0.18
13.50	2.30	0.62	0.16
13.75	2.33	0.64	0.14
14.00	2.36	0.66	0.12
14.25	2.39	0.67	0.11
14.50	2.41	0.69	0.11
14.75	2.44	0.70	0.10
15.00	2.46	0.71	0.10
15.25	2.48	0.73	0.09
15.50	2.50	0.74	0.09
15.75	2.52	0.75	0.08
16.00	2.53	0.76	0.08
16.25	2.55	0.77	0.07
16.50	2.57	0.78	0.07
16.75	2.58	0.79	0.07
17.00	2.60	0.80	0.07
17.25	2.61	0.81	0.07
17.50	2.63	0.82	0.07
17.75	2.64	0.83	0.06
18.00	2.65	0.84	0.06
18.25	2.67	0.85	0.06
18.50	2.68	0.85	0.06
18.75	2.69	0.86	0.06
19.00	2.70	0.87	0.05
19.25	2.71	0.88	0.05
19.50	2.72	0.88	0.05
19.75	2.73	0.89	0.05
20.00	**2.74**	**0.90**	0.05

Summary for Subcatchment 18S: DA-3

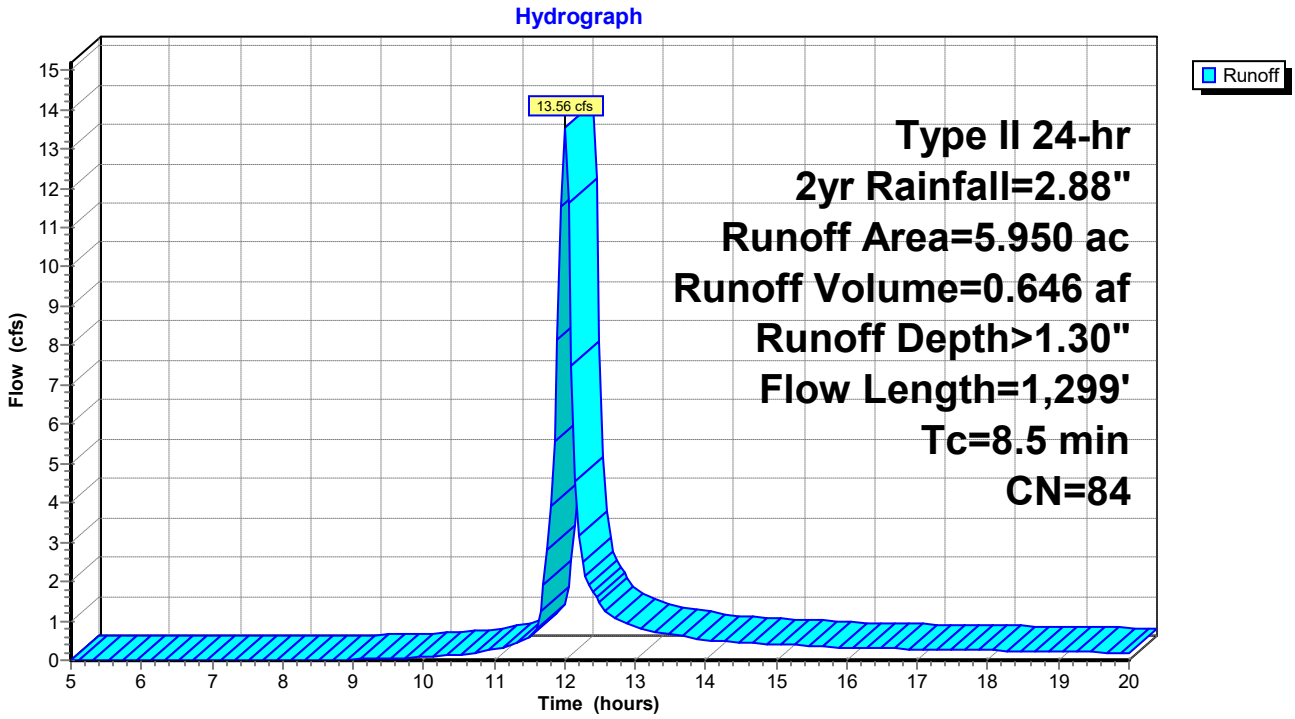
Runoff = 13.56 cfs @ 12.00 hrs, Volume= 0.646 af, Depth> 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.88"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
3.757	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
5.950	84	Weighted Average
5.950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	412	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	330	0.0320	2.28	3.19	**Channel Flow,** Area= 1.4 sf Perim= 5.3' r= 0.26' n= 0.048
2.7	557	0.0200	3.47	10.08	**Channel Flow,** Area= 2.9 sf Perim= 5.6' r= 0.52' n= 0.039
8.5	1,299	Total			

Subcatchment 18S: DA-3



Hydrograph for Subcatchment 18S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.18	0.00	0.00
5.25	0.19	0.00	0.00
5.50	0.21	0.00	0.00
5.75	0.22	0.00	0.00
6.00	0.23	0.00	0.00
6.25	0.24	0.00	0.00
6.50	0.26	0.00	0.00
6.75	0.27	0.00	0.00
7.00	0.29	0.00	0.00
7.25	0.30	0.00	0.00
7.50	0.31	0.00	0.00
7.75	0.33	0.00	0.00
8.00	0.35	0.00	0.00
8.25	0.36	0.00	0.00
8.50	0.38	0.00	0.00
8.75	0.40	0.00	0.00
9.00	0.42	0.00	0.02
9.25	0.45	0.00	0.03
9.50	0.47	0.00	0.04
9.75	0.49	0.01	0.06
10.00	0.52	0.01	0.08
10.25	0.55	0.01	0.11
10.50	0.59	0.02	0.14
10.75	0.63	0.03	0.20
11.00	0.68	0.04	0.27
11.25	0.74	0.06	0.39
11.50	0.82	0.08	0.58
11.75	1.11	0.20	2.82
12.00	1.91	0.68	**13.56**
12.25	2.03	0.77	2.50
12.50	2.12	0.83	1.45
12.75	2.17	0.87	1.03
13.00	2.22	0.91	0.87
13.25	2.26	0.94	0.74
13.50	2.30	0.96	0.66
13.75	2.33	0.99	0.58
14.00	2.36	1.01	0.52
14.25	2.39	1.03	0.48
14.50	2.41	1.05	0.45
14.75	2.44	1.07	0.43
15.00	2.46	1.08	0.41
15.25	2.48	1.10	0.39
15.50	2.50	1.11	0.37
15.75	2.52	1.13	0.34
16.00	2.53	1.14	0.32
16.25	2.55	1.16	0.31
16.50	2.57	1.17	0.30
16.75	2.58	1.18	0.29
17.00	2.60	1.19	0.28
17.25	2.61	1.20	0.27
17.50	2.63	1.21	0.27
17.75	2.64	1.23	0.26
18.00	2.65	1.24	0.25
18.25	2.67	1.25	0.24
18.50	2.68	1.26	0.23
18.75	2.69	1.26	0.23
19.00	2.70	1.27	0.22
19.25	2.71	1.28	0.21
19.50	2.72	1.29	0.20
19.75	2.73	1.30	0.19
20.00	**2.74**	**1.31**	0.18

Summary for Subcatchment 19S: DA-1

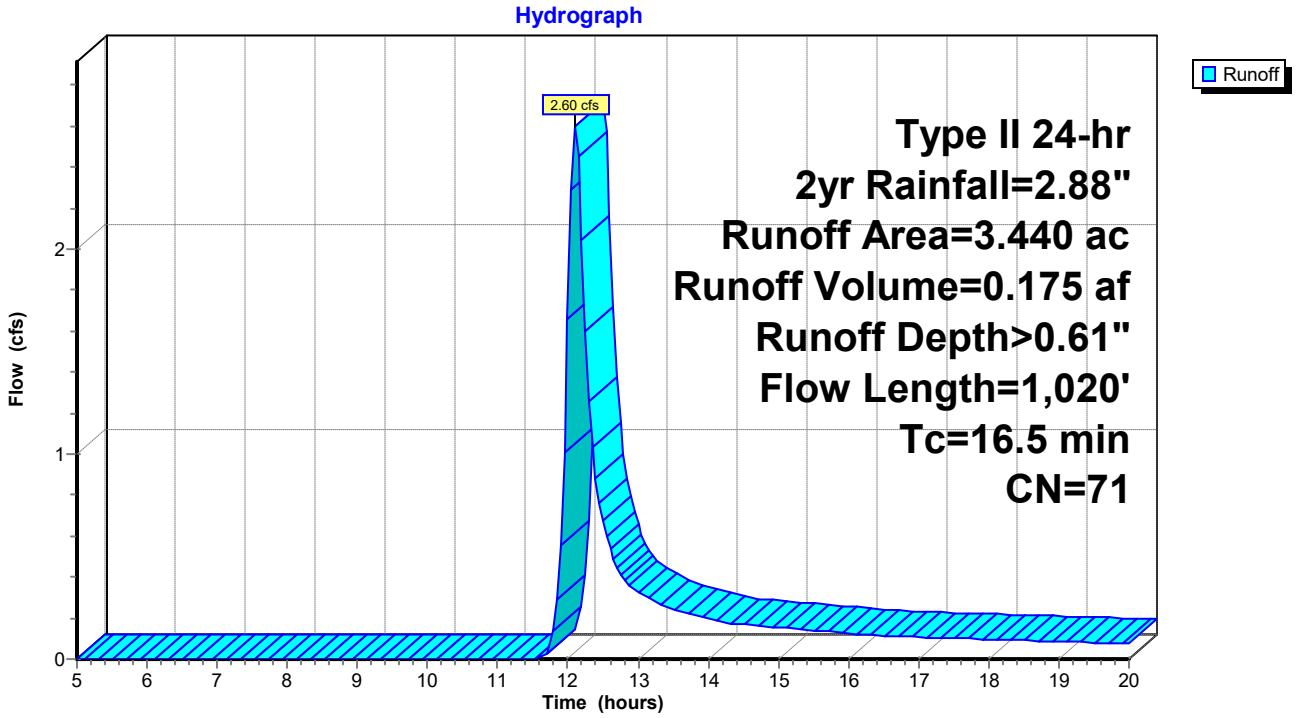
Runoff = 2.60 cfs @ 12.11 hrs, Volume= 0.175 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.88"

Area (ac)	CN	Description
3.440	71	Meadow, non-grazed, HSG C
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
9.8	920	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.5	1,020	Total			

Subcatchment 19S: DA-1



Hydrograph for Subcatchment 19S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.18	0.00	0.00
5.25	0.19	0.00	0.00
5.50	0.21	0.00	0.00
5.75	0.22	0.00	0.00
6.00	0.23	0.00	0.00
6.25	0.24	0.00	0.00
6.50	0.26	0.00	0.00
6.75	0.27	0.00	0.00
7.00	0.29	0.00	0.00
7.25	0.30	0.00	0.00
7.50	0.31	0.00	0.00
7.75	0.33	0.00	0.00
8.00	0.35	0.00	0.00
8.25	0.36	0.00	0.00
8.50	0.38	0.00	0.00
8.75	0.40	0.00	0.00
9.00	0.42	0.00	0.00
9.25	0.45	0.00	0.00
9.50	0.47	0.00	0.00
9.75	0.49	0.00	0.00
10.00	0.52	0.00	0.00
10.25	0.55	0.00	0.00
10.50	0.59	0.00	0.00
10.75	0.63	0.00	0.00
11.00	0.68	0.00	0.00
11.25	0.74	0.00	0.00
11.50	0.82	0.00	0.00
11.75	1.11	0.02	0.06
12.00	1.91	0.23	**1.66**
12.25	2.03	0.28	**1.60**
12.50	2.12	0.31	0.67
12.75	2.17	0.34	0.41
13.00	2.22	0.36	0.33
13.25	2.26	0.38	0.28
13.50	2.30	0.40	0.25
13.75	2.33	0.41	0.22
14.00	2.36	0.42	0.20
14.25	2.39	0.44	0.18
14.50	2.41	0.45	0.17
14.75	2.44	0.46	0.16
15.00	2.46	0.47	0.15
15.25	2.48	0.48	0.15
15.50	2.50	0.49	0.14
15.75	2.52	0.50	0.13
16.00	2.53	0.51	0.12
16.25	2.55	0.52	0.12
16.50	2.57	0.52	0.11
16.75	2.58	0.53	0.11
17.00	2.60	0.54	0.11
17.25	2.61	0.55	0.11
17.50	2.63	0.56	0.10
17.75	2.64	0.56	0.10
18.00	2.65	0.57	0.10
18.25	2.67	0.58	0.09
18.50	2.68	0.58	0.09
18.75	2.69	0.59	0.09
19.00	2.70	0.59	0.09
19.25	2.71	0.60	0.08
19.50	2.72	0.61	0.08
19.75	2.73	0.61	0.08
20.00	**2.74**	**0.62**	0.07

Summary for Subcatchment 20S: DA-4

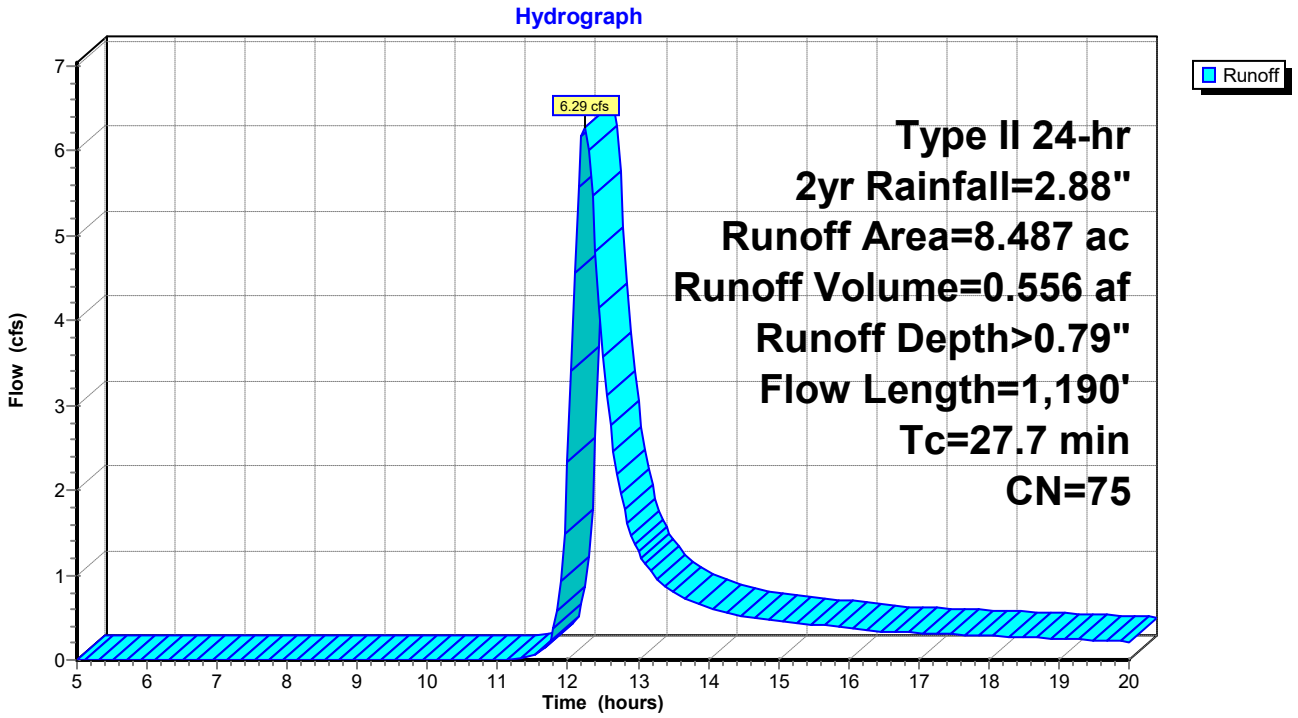
Runoff = 6.29 cfs @ 12.24 hrs, Volume= 0.556 af, Depth> 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.88"

Area (ac)	CN	Description
3.538	71	Meadow, non-grazed, HSG C
4.312	78	Meadow, non-grazed, HSG D
0.427	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.487	75	Weighted Average
8.487		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
4.4	370	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	526	0.0250	1.56	1.87	**Channel Flow,** Area= 1.2 sf Perim= 4.9' r= 0.24' n= 0.059
2.0	194	0.0510	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.7	1,190	Total			

Subcatchment 20S: DA-4



Hydrograph for Subcatchment 20S: DA-4

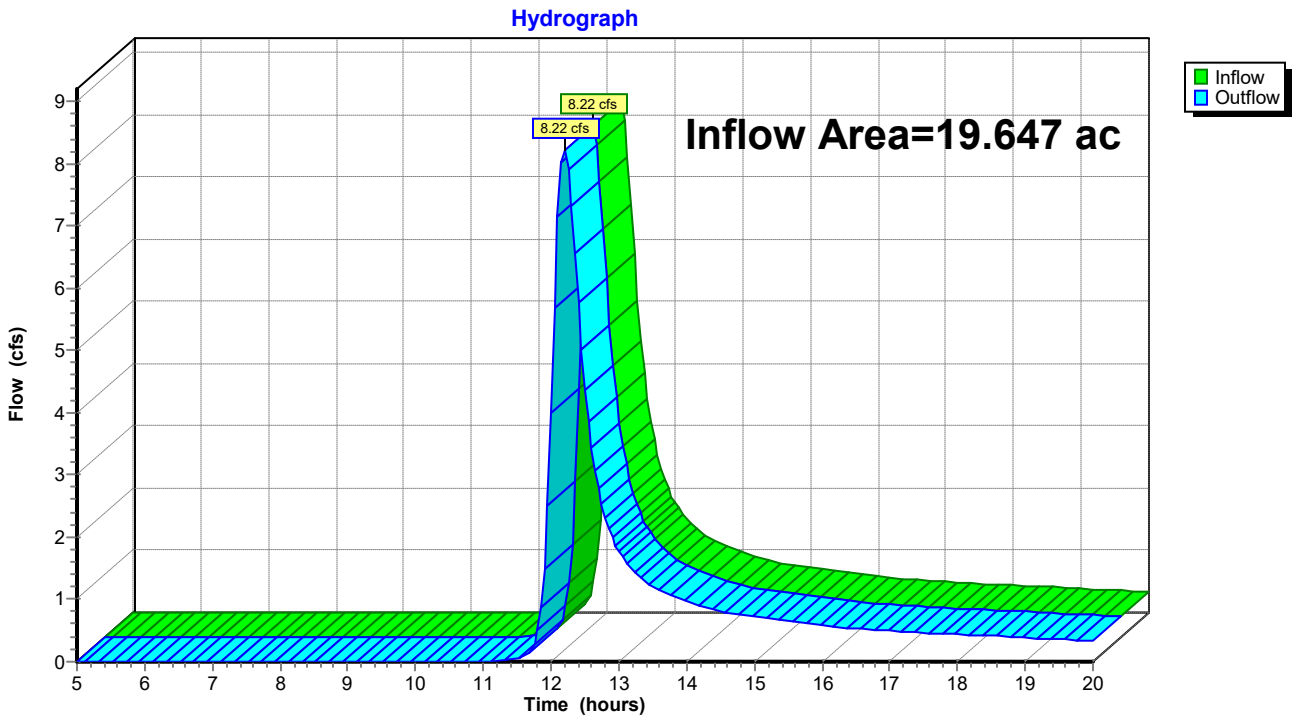
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.18	0.00	0.00
5.25	0.19	0.00	0.00
5.50	0.21	0.00	0.00
5.75	0.22	0.00	0.00
6.00	0.23	0.00	0.00
6.25	0.24	0.00	0.00
6.50	0.26	0.00	0.00
6.75	0.27	0.00	0.00
7.00	0.29	0.00	0.00
7.25	0.30	0.00	0.00
7.50	0.31	0.00	0.00
7.75	0.33	0.00	0.00
8.00	0.35	0.00	0.00
8.25	0.36	0.00	0.00
8.50	0.38	0.00	0.00
8.75	0.40	0.00	0.00
9.00	0.42	0.00	0.00
9.25	0.45	0.00	0.00
9.50	0.47	0.00	0.00
9.75	0.49	0.00	0.00
10.00	0.52	0.00	0.00
10.25	0.55	0.00	0.00
10.50	0.59	0.00	0.00
10.75	0.63	0.00	0.00
11.00	0.68	0.00	0.00
11.25	0.74	0.00	0.01
11.50	0.82	0.01	0.05
11.75	1.11	0.05	0.23
12.00	1.91	0.34	2.33
12.25	2.03	0.40	**6.28**
12.50	2.12	0.44	3.57
12.75	2.17	0.47	1.96
13.00	2.22	0.50	1.27
13.25	2.26	0.52	0.97
13.50	2.30	0.54	0.80
13.75	2.33	0.56	0.70
14.00	2.36	0.57	0.63
14.25	2.39	0.59	0.56
14.50	2.41	0.60	0.51
14.75	2.44	0.61	0.49
15.00	2.46	0.63	0.46
15.25	2.48	0.64	0.44
15.50	2.50	0.65	0.42
15.75	2.52	0.66	0.40
16.00	2.53	0.67	0.37
16.25	2.55	0.68	0.35
16.50	2.57	0.69	0.34
16.75	2.58	0.70	0.32
17.00	2.60	0.71	0.32
17.25	2.61	0.72	0.31
17.50	2.63	0.73	0.30
17.75	2.64	0.73	0.29
18.00	2.65	0.74	0.28
18.25	2.67	0.75	0.28
18.50	2.68	0.76	0.27
18.75	2.69	0.76	0.26
19.00	2.70	0.77	0.25
19.25	2.71	0.78	0.24
19.50	2.72	0.78	0.23
19.75	2.73	0.79	0.22
20.00	**2.74**	**0.80**	0.21

Summary for Reach 6R: Reach

Inflow Area = 19.647 ac, 0.00% Impervious, Inflow Depth > 0.48" for 2yr event
Inflow = 8.22 cfs @ 12.19 hrs, Volume= 0.792 af
Outflow = 8.22 cfs @ 12.19 hrs, Volume= 0.792 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Reach



Hydrograph for Reach 6R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.00		0.00
8.50	0.00		0.00
8.75	0.00		0.00
9.00	0.00		0.00
9.25	0.00		0.00
9.50	0.00		0.00
9.75	0.00		0.00
10.00	0.00		0.00
10.25	0.00		0.00
10.50	0.00		0.00
10.75	0.00		0.00
11.00	0.00		0.00
11.25	0.01		0.01
11.50	0.05		0.05
11.75	0.29		0.29
12.00	**3.99**		**3.99**
12.25	**7.90**		**7.90**
12.50	4.36		4.36
12.75	2.52		2.52
13.00	1.77		1.77
13.25	1.42		1.42
13.50	1.21		1.21
13.75	1.08		1.08
14.00	0.97		0.97
14.25	0.87		0.87
14.50	0.81		0.81
14.75	0.77		0.77
15.00	0.73		0.73
15.25	0.69		0.69
15.50	0.66		0.66
15.75	0.62		0.62
16.00	0.59		0.59
16.25	0.55		0.55
16.50	0.53		0.53
16.75	0.51		0.51
17.00	0.50		0.50
17.25	0.48		0.48
17.50	0.47		0.47
17.75	0.45		0.45
18.00	0.44		0.44
18.25	0.43		0.43
18.50	0.41		0.41
18.75	0.40		0.40
19.00	0.39		0.39
19.25	0.37		0.37
19.50	0.36		0.36
19.75	0.35		0.35
20.00	0.33		0.33

Summary for Pond 11P: Infiltration basin

Inflow Area =	1.770 ac,	0.00% Impervious,	Inflow Depth >	0.89"	for 2yr event
Inflow =	2.51 cfs @	12.04 hrs,	Volume=	0.132 af	
Outflow =	0.18 cfs @	13.18 hrs,	Volume=	0.069 af,	Atten= 93%, Lag= 68.7 min
Discarded =	0.01 cfs @	13.18 hrs,	Volume=	0.009 af	
Primary =	0.17 cfs @	13.18 hrs,	Volume=	0.060 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,276.20' @ 13.18 hrs Surf.Area= 4,560 sf Storage= 3,184 cf

Plug-Flow detention time= 199.6 min calculated for 0.069 af (52% of inflow)
Center-of-Mass det. time= 111.8 min (921.7 - 809.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,275.00'	17,576 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

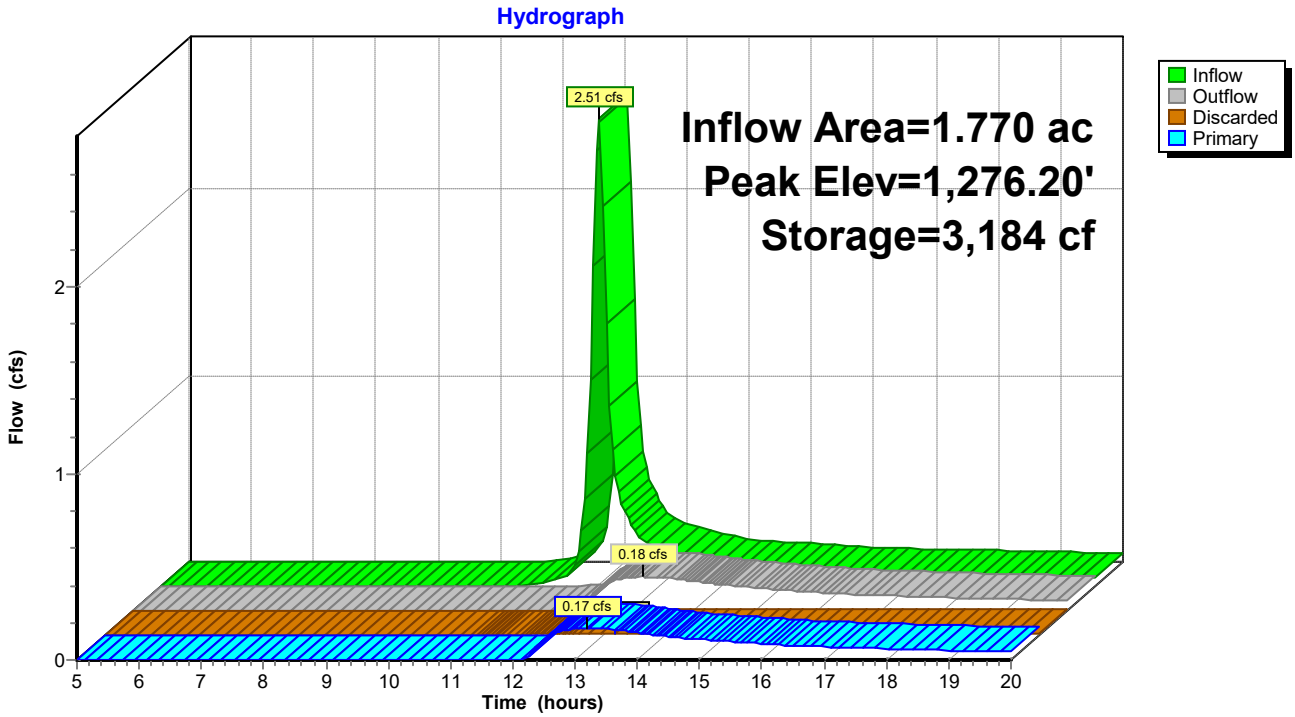
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,275.00	898	0	0
1,276.00	3,791	2,345	2,345
1,278.00	11,440	15,231	17,576

Device	Routing	Invert	Outlet Devices
#1	Primary	1,276.00'	**18.0" Round Pipe** L= 25.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,276.00' / 1,272.00' S= 0.1600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	1,275.00'	**0.125 in/hr Exfiltration over Surface area**
#3	Primary	1,277.00'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

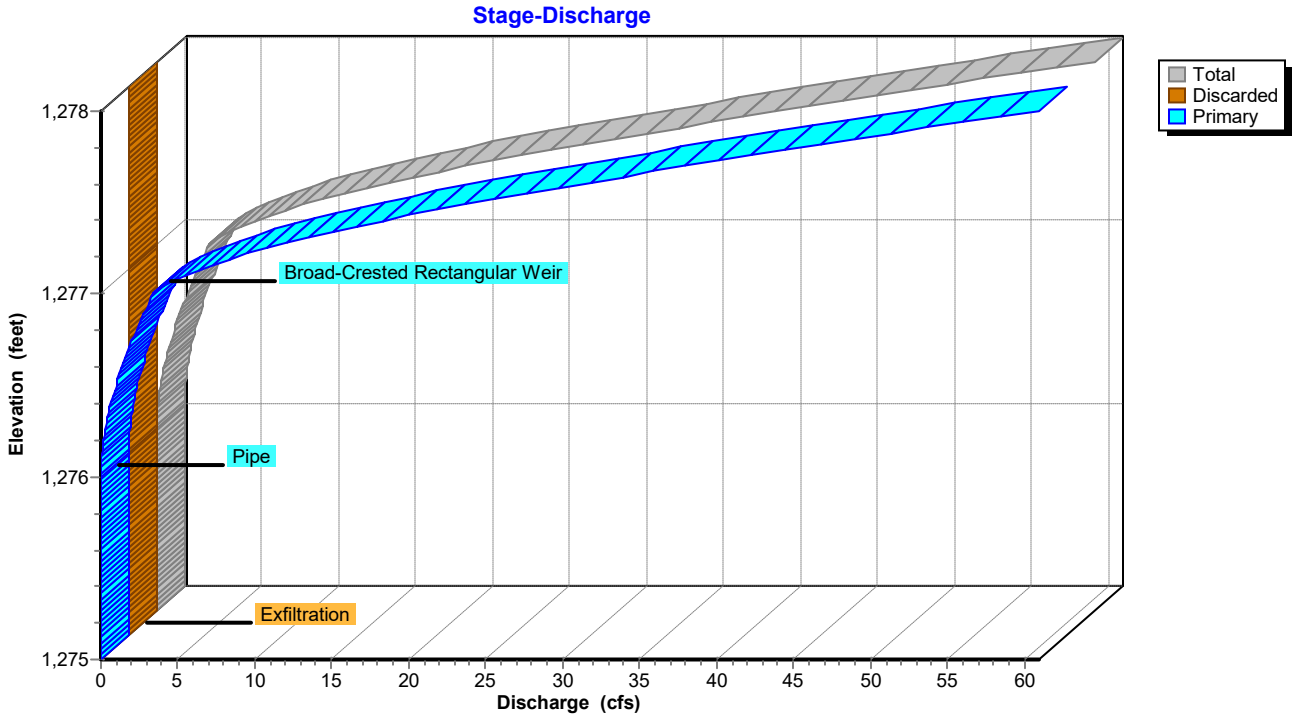
Discarded OutFlow Max=0.01 cfs @ 13.18 hrs HW=1,276.20' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.17 cfs @ 13.18 hrs HW=1,276.20' (Free Discharge)
├─**1=Pipe** (Inlet Controls 0.17 cfs @ 1.20 fps)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: Infiltration basin



Pond 11P: Infiltration basin



Hydrograph for Pond 11P: Infiltration basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.00	0.00	0	1,275.00	0.00	0.00	0.00
5.50	0.00	0	1,275.00	0.00	0.00	0.00
6.00	0.00	0	1,275.00	0.00	0.00	0.00
6.50	0.00	0	1,275.00	0.00	0.00	0.00
7.00	0.00	0	1,275.00	0.00	0.00	0.00
7.50	0.00	0	1,275.00	0.00	0.00	0.00
8.00	0.00	0	1,275.00	0.00	0.00	0.00
8.50	0.00	0	1,275.00	0.00	0.00	0.00
9.00	0.00	0	1,275.00	0.00	0.00	0.00
9.50	0.00	0	1,275.00	0.00	0.00	0.00
10.00	0.00	0	1,275.00	0.00	0.00	0.00
10.50	0.00	0	1,275.00	0.00	0.00	0.00
11.00	0.01	5	1,275.01	0.00	0.00	0.00
11.50	0.05	52	1,275.05	0.00	0.00	0.00
12.00	**2.33**	1,116	1,275.62	0.01	0.01	0.00
12.50	**0.36**	2,999	1,276.16	0.12	0.01	0.11
13.00	0.21	**3,176**	**1,276.20**	**0.18**	**0.01**	**0.17**
13.50	0.16	**3,170**	**1,276.20**	**0.18**	**0.01**	**0.17**
14.00	0.12	3,116	1,276.19	0.16	0.01	0.15
14.50	0.11	3,055	1,276.17	0.14	0.01	0.13
15.00	0.10	3,006	1,276.16	0.12	0.01	0.11
15.50	0.09	2,964	1,276.15	0.11	0.01	0.10
16.00	0.08	2,925	1,276.14	0.10	0.01	0.09
16.50	0.07	2,889	1,276.13	0.09	0.01	0.08
17.00	0.07	2,860	1,276.13	0.08	0.01	0.07
17.50	0.07	2,837	1,276.12	0.08	0.01	0.06
18.00	0.06	2,817	1,276.12	0.07	0.01	0.06
18.50	0.06	2,798	1,276.11	0.07	0.01	0.06
19.00	0.05	2,781	1,276.11	0.06	0.01	0.05
19.50	0.05	2,763	1,276.10	0.06	0.01	0.05
20.00	0.05	2,744	1,276.10	0.06	0.01	0.04

Stage-Discharge for Pond 11P: Infiltration basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
1,275.00	0.00	0.00	0.00
1,275.05	0.00	0.00	0.00
1,275.10	0.00	0.00	0.00
1,275.15	0.00	0.00	0.00
1,275.20	0.00	0.00	0.00
1,275.25	0.00	0.00	0.00
1,275.30	0.01	0.01	0.00
1,275.35	0.01	0.01	0.00
1,275.40	0.01	0.01	0.00
1,275.45	0.01	0.01	0.00
1,275.50	0.01	0.01	0.00
1,275.55	0.01	0.01	0.00
1,275.60	0.01	0.01	0.00
1,275.65	0.01	0.01	0.00
1,275.70	0.01	0.01	0.00
1,275.75	0.01	0.01	0.00
1,275.80	0.01	0.01	0.00
1,275.85	0.01	0.01	0.00
1,275.90	0.01	0.01	0.00
1,275.95	0.01	0.01	0.00
1,276.00	0.01	0.01	0.00
1,276.05	0.02	0.01	0.01
1,276.10	0.06	0.01	0.04
1,276.15	0.11	0.01	0.10
1,276.20	0.18	0.01	0.17
1,276.25	0.27	0.01	0.26
1,276.30	0.38	0.01	0.37
1,276.35	0.51	0.01	0.50
1,276.40	0.66	0.02	0.64
1,276.45	0.82	0.02	0.80
1,276.50	1.00	0.02	0.98
1,276.55	1.19	0.02	1.17
1,276.60	1.39	0.02	1.37
1,276.65	1.61	0.02	1.59
1,276.70	1.84	0.02	1.82
1,276.75	2.08	0.02	2.06
1,276.80	2.32	0.02	2.30
1,276.85	2.58	0.02	2.56
1,276.90	2.84	0.02	2.82
1,276.95	3.11	0.02	3.09
1,277.00	3.39	0.02	3.36
1,277.05	4.19	0.02	4.17
1,277.10	5.44	0.02	5.42
1,277.15	6.98	0.02	6.96
1,277.20	8.74	0.02	8.72
1,277.25	10.80	0.02	10.78
1,277.30	13.10	0.03	13.07
1,277.35	15.61	0.03	15.58
1,277.40	18.34	0.03	18.31
1,277.45	21.25	0.03	21.22
1,277.50	24.34	0.03	24.31
1,277.55	27.68	0.03	27.65
1,277.60	31.23	0.03	31.20
1,277.65	34.57	0.03	34.54
1,277.70	38.03	0.03	38.00
1,277.75	41.59	0.03	41.56
1,277.80	45.27	0.03	45.24
1,277.85	49.04	0.03	49.01
1,277.90	52.91	0.03	52.88
1,277.95	56.88	0.03	56.85
1,278.00	**60.94**	**0.03**	**60.91**

Stage-Area-Storage for Pond 11P: Infiltration basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,275.00	898	0
1,275.05	1,043	49
1,275.10	1,187	104
1,275.15	1,332	167
1,275.20	1,477	237
1,275.25	1,621	315
1,275.30	1,766	400
1,275.35	1,911	491
1,275.40	2,055	591
1,275.45	2,200	697
1,275.50	2,345	811
1,275.55	2,489	931
1,275.60	2,634	1,060
1,275.65	2,778	1,195
1,275.70	2,923	1,337
1,275.75	3,068	1,487
1,275.80	3,212	1,644
1,275.85	3,357	1,808
1,275.90	3,502	1,980
1,275.95	3,646	2,159
1,276.00	3,791	2,345
1,276.05	3,982	2,539
1,276.10	4,173	2,743
1,276.15	4,365	2,956
1,276.20	4,556	3,179
1,276.25	4,747	3,412
1,276.30	4,938	3,654
1,276.35	5,130	3,906
1,276.40	5,321	4,167
1,276.45	5,512	4,438
1,276.50	5,703	4,718
1,276.55	5,894	5,008
1,276.60	6,086	5,308
1,276.65	6,277	5,617
1,276.70	6,468	5,935
1,276.75	6,659	6,263
1,276.80	6,851	6,601
1,276.85	7,042	6,948
1,276.90	7,233	7,305
1,276.95	7,424	7,672
1,277.00	7,616	8,048
1,277.05	7,807	8,433
1,277.10	7,998	8,828
1,277.15	8,189	9,233
1,277.20	8,380	9,647
1,277.25	8,572	10,071
1,277.30	8,763	10,505
1,277.35	8,954	10,947
1,277.40	9,145	11,400
1,277.45	9,337	11,862
1,277.50	9,528	12,334
1,277.55	9,719	12,815
1,277.60	9,910	13,305
1,277.65	10,101	13,806
1,277.70	10,293	14,316
1,277.75	10,484	14,835
1,277.80	10,675	15,364
1,277.85	10,866	15,903
1,277.90	11,058	16,451
1,277.95	11,249	17,008
1,278.00	**11,440**	**17,576**

Summary for Pond 13P: Wet Pond

Inflow Area =	5.950 ac,	0.00% Impervious,	Inflow Depth >	1.30"	for 2yr event
Inflow =	13.56 cfs @	12.00 hrs,	Volume=	0.646 af	
Outflow =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af,	Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	
Secondary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,289.66' @ 20.00 hrs Surf.Area= 26,069 sf Storage= 28,133 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,288.50'	214,237 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

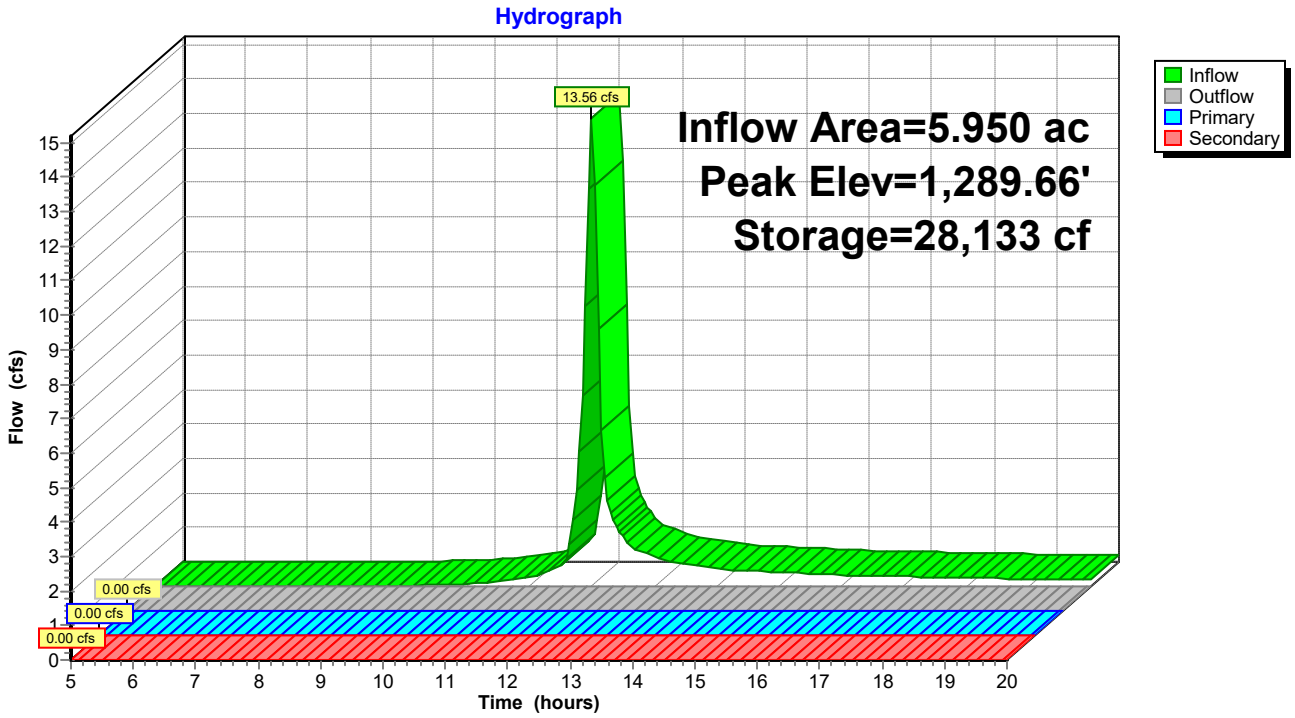
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,288.50	22,471	0	0
1,290.00	27,127	37,199	37,199
1,292.00	33,940	61,067	98,266
1,294.00	40,276	74,216	172,482
1,295.00	43,234	41,755	214,237

Device	Routing	Invert	Outlet Devices
#1	Primary	1,289.50'	**15.0" Round Pipe** L= 100.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,289.50' / 1,289.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,290.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,291.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1,292.00'	**1.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	1,293.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

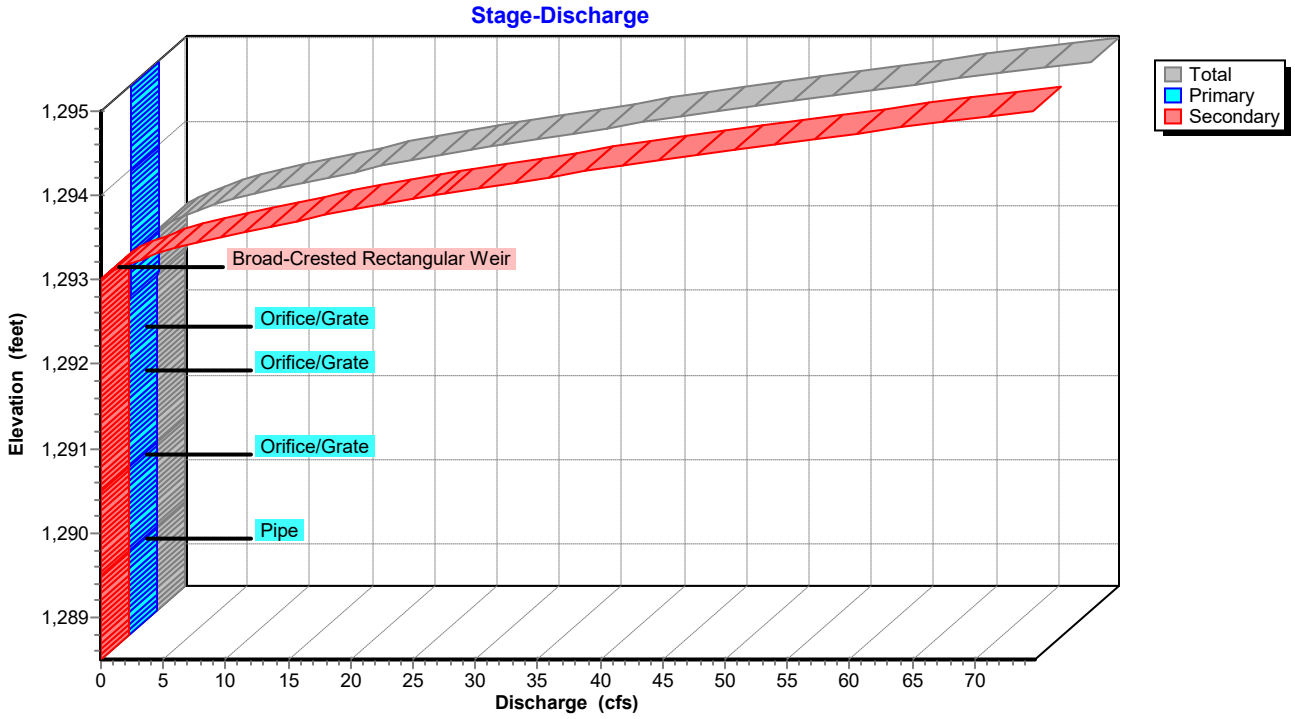
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**1=Pipe** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 13P: Wet Pond



Pond 13P: Wet Pond



Hydrograph for Pond 13P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.00	0.00	0	1,288.50	**0.00**	**0.00**	**0.00**
5.50	0.00	0	1,288.50	0.00	0.00	0.00
6.00	0.00	0	1,288.50	0.00	0.00	0.00
6.50	0.00	0	1,288.50	0.00	0.00	0.00
7.00	0.00	0	1,288.50	0.00	0.00	0.00
7.50	0.00	0	1,288.50	0.00	0.00	0.00
8.00	0.00	0	1,288.50	0.00	0.00	0.00
8.50	0.00	0	1,288.50	0.00	0.00	0.00
9.00	0.02	11	1,288.50	0.00	0.00	0.00
9.50	0.04	64	1,288.50	0.00	0.00	0.00
10.00	0.08	169	1,288.51	0.00	0.00	0.00
10.50	0.14	364	1,288.52	0.00	0.00	0.00
11.00	0.27	725	1,288.53	0.00	0.00	0.00
11.50	0.58	1,446	1,288.56	0.00	0.00	0.00
12.00	**13.56**	9,299	1,288.90	0.00	0.00	0.00
12.50	1.45	17,251	1,289.23	0.00	0.00	0.00
13.00	0.87	19,171	1,289.31	0.00	0.00	0.00
13.50	0.66	20,517	1,289.36	0.00	0.00	0.00
14.00	0.52	21,568	1,289.40	0.00	0.00	0.00
14.50	0.45	22,430	1,289.44	0.00	0.00	0.00
15.00	0.41	23,210	1,289.47	0.00	0.00	0.00
15.50	0.37	23,910	1,289.50	0.00	0.00	0.00
16.00	0.32	24,531	1,289.52	0.00	0.00	0.00
16.50	0.30	25,084	1,289.54	0.00	0.00	0.00
17.00	0.28	25,607	1,289.56	0.00	0.00	0.00
17.50	0.27	26,102	1,289.58	0.00	0.00	0.00
18.00	0.25	26,567	1,289.60	0.00	0.00	0.00
18.50	0.23	27,004	1,289.62	0.00	0.00	0.00
19.00	0.22	27,411	1,289.63	0.00	0.00	0.00
19.50	0.20	27,787	1,289.65	0.00	0.00	0.00
20.00	0.18	**28,134**	**1,289.66**	0.00	0.00	0.00

Stage-Discharge for Pond 13P: Wet Pond

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
1,288.50	0.00	0.00	0.00
1,288.60	0.00	0.00	0.00
1,288.70	0.00	0.00	0.00
1,288.80	0.00	0.00	0.00
1,288.90	0.00	0.00	0.00
1,289.00	0.00	0.00	0.00
1,289.10	0.00	0.00	0.00
1,289.20	0.00	0.00	0.00
1,289.30	0.00	0.00	0.00
1,289.40	0.00	0.00	0.00
1,289.50	0.00	0.00	0.00
1,289.60	0.00	0.00	0.00
1,289.70	0.00	0.00	0.00
1,289.80	0.00	0.00	0.00
1,289.90	0.00	0.00	0.00
1,290.00	0.00	0.00	0.00
1,290.10	0.00	0.00	0.00
1,290.20	0.00	0.00	0.00
1,290.30	0.00	0.00	0.00
1,290.40	0.00	0.00	0.00
1,290.50	0.00	0.00	0.00
1,290.60	0.01	0.01	0.00
1,290.70	0.01	0.01	0.00
1,290.80	0.01	0.01	0.00
1,290.90	0.02	0.02	0.00
1,291.00	0.02	0.02	0.00
1,291.10	0.02	0.02	0.00
1,291.20	0.02	0.02	0.00
1,291.30	0.02	0.02	0.00
1,291.40	0.02	0.02	0.00
1,291.50	0.03	0.03	0.00
1,291.60	0.03	0.03	0.00
1,291.70	0.04	0.04	0.00
1,291.80	0.04	0.04	0.00
1,291.90	0.05	0.05	0.00
1,292.00	0.05	0.05	0.00
1,292.10	0.06	0.06	0.00
1,292.20	0.07	0.07	0.00
1,292.30	0.07	0.07	0.00
1,292.40	0.08	0.08	0.00
1,292.50	0.08	0.08	0.00
1,292.60	0.08	0.08	0.00
1,292.70	0.09	0.09	0.00
1,292.80	0.09	0.09	0.00
1,292.90	0.10	0.10	0.00
1,293.00	0.10	0.10	0.00
1,293.10	0.91	0.10	0.81
1,293.20	2.40	0.10	2.30
1,293.30	4.37	0.11	4.26
1,293.40	6.74	0.11	6.63
1,293.50	9.52	0.11	9.40
1,293.60	12.66	0.12	12.55
1,293.70	15.84	0.12	15.73
1,293.80	19.23	0.12	19.10
1,293.90	22.88	0.12	22.75
1,294.00	26.73	0.13	26.60
1,294.10	30.88	0.13	30.75
1,294.20	35.23	0.13	35.10
1,294.30	39.64	0.13	39.50
1,294.40	44.20	0.14	44.06
1,294.50	48.82	0.14	48.68
1,294.60	53.57	0.14	53.43
1,294.70	58.66	0.14	58.52
1,294.80	63.90	0.15	63.75
1,294.90	69.29	0.15	69.14
1,295.00	**74.82**	**0.15**	**74.67**

Stage-Area-Storage for Pond 13P: Wet Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,288.50	22,471	0
1,288.60	22,781	2,263
1,288.70	23,092	4,556
1,288.80	23,402	6,881
1,288.90	23,713	9,237
1,289.00	24,023	11,624
1,289.10	24,333	14,041
1,289.20	24,644	16,490
1,289.30	24,954	18,970
1,289.40	25,265	21,481
1,289.50	25,575	24,023
1,289.60	25,885	26,596
1,289.70	26,196	29,200
1,289.80	26,506	31,835
1,289.90	26,817	34,501
1,290.00	27,127	37,199
1,290.10	27,468	39,928
1,290.20	27,808	42,692
1,290.30	28,149	45,490
1,290.40	28,490	48,322
1,290.50	28,830	51,188
1,290.60	29,171	54,088
1,290.70	29,512	57,022
1,290.80	29,852	59,990
1,290.90	30,193	62,992
1,291.00	30,534	66,029
1,291.10	30,874	69,099
1,291.20	31,215	72,204
1,291.30	31,555	75,342
1,291.40	31,896	78,515
1,291.50	32,237	81,721
1,291.60	32,577	84,962
1,291.70	32,918	88,237
1,291.80	33,259	91,546
1,291.90	33,599	94,889
1,292.00	33,940	98,266
1,292.10	34,257	101,675
1,292.20	34,574	105,117
1,292.30	34,890	108,590
1,292.40	35,207	112,095
1,292.50	35,524	115,632
1,292.60	35,841	119,200
1,292.70	36,158	122,800
1,292.80	36,474	126,431
1,292.90	36,791	130,095
1,293.00	37,108	133,790
1,293.10	37,425	137,516
1,293.20	37,742	141,274
1,293.30	38,058	145,064
1,293.40	38,375	148,886
1,293.50	38,692	152,740
1,293.60	39,009	156,625
1,293.70	39,326	160,541
1,293.80	39,642	164,490
1,293.90	39,959	168,470
1,294.00	40,276	172,482
1,294.10	40,572	176,524
1,294.20	40,868	180,596
1,294.30	41,163	184,697
1,294.40	41,459	188,829
1,294.50	41,755	192,989
1,294.60	42,051	197,180
1,294.70	42,347	201,399
1,294.80	42,642	205,649
1,294.90	42,938	209,928
1,295.00	**43,234**	**214,237**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 14S: DA-2 Runoff Area=1.770 ac 0.00% Impervious Runoff Depth>1.77"
Flow Length=369' Tc=11.1 min CN=77 Runoff=4.99 cfs 0.261 af

Subcatchment 18S: DA-3 Runoff Area=5.950 ac 0.00% Impervious Runoff Depth>2.32"
Flow Length=1,299' Tc=8.5 min CN=84 Runoff=23.66 cfs 1.152 af

Subcatchment 19S: DA-1 Runoff Area=3.440 ac 0.00% Impervious Runoff Depth>1.35"
Flow Length=1,020' Tc=16.5 min CN=71 Runoff=6.15 cfs 0.388 af

Subcatchment 20S: DA-4 Runoff Area=8.487 ac 0.00% Impervious Runoff Depth>1.61"
Flow Length=1,190' Tc=27.7 min CN=75 Runoff=13.50 cfs 1.141 af

Reach 6R: Reach Inflow=19.28 cfs 1.713 af
Outflow=19.28 cfs 1.713 af

Pond 11P: Infiltration basin Peak Elev=1,276.57' Storage=5,127 cf Inflow=4.99 cfs 0.261 af
Discarded=0.02 cfs 0.010 af Primary=1.25 cfs 0.184 af Outflow=1.27 cfs 0.194 af

Pond 13P: Wet Pond Peak Elev=1,290.46' Storage=50,140 cf Inflow=23.66 cfs 1.152 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 19.647 ac Runoff Volume = 2.941 af Average Runoff Depth = 1.80"
100.00% Pervious = 19.647 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 14S: DA-2

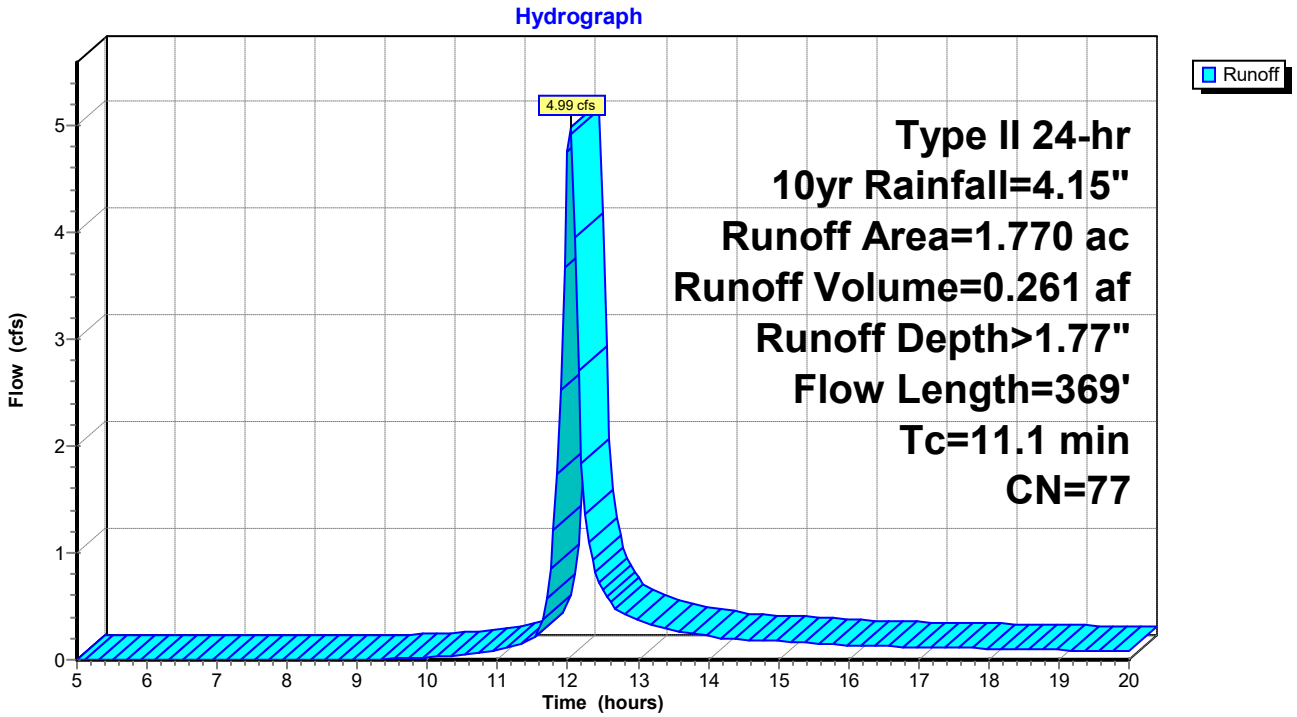
Runoff = 4.99 cfs @ 12.03 hrs, Volume= 0.261 af, Depth> 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

	Area (ac)	CN	Description
*	0.545	89	Gravel, HSG C
	1.225	71	Meadow, non-grazed, HSG C
	1.770	77	Weighted Average
	1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	175	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	54	0.0750	1.37		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.1	369	Total			

Subcatchment 14S: DA-2



Hydrograph for Subcatchment 14S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.00
6.75	0.39	0.00	0.00
7.00	0.41	0.00	0.00
7.25	0.43	0.00	0.00
7.50	0.45	0.00	0.00
7.75	0.48	0.00	0.00
8.00	0.50	0.00	0.00
8.25	0.52	0.00	0.00
8.50	0.55	0.00	0.00
8.75	0.58	0.00	0.00
9.00	0.61	0.00	0.00
9.25	0.64	0.00	0.00
9.50	0.68	0.00	0.01
9.75	0.71	0.00	0.01
10.00	0.75	0.01	0.02
10.25	0.80	0.01	0.03
10.50	0.85	0.02	0.05
10.75	0.91	0.03	0.06
11.00	0.98	0.04	0.09
11.25	1.06	0.06	0.13
11.50	1.17	0.09	0.20
11.75	1.61	0.25	0.85
12.00	2.75	0.90	**4.76**
12.25	2.93	1.02	**1.36**
12.50	3.05	1.11	0.66
12.75	3.13	1.16	0.44
13.00	3.20	1.21	0.37
13.25	3.26	1.26	0.31
13.50	3.32	1.30	0.28
13.75	3.36	1.33	0.25
14.00	3.40	1.36	0.22
14.25	3.44	1.39	0.20
14.50	3.48	1.41	0.19
14.75	3.51	1.44	0.18
15.00	3.54	1.46	0.17
15.25	3.57	1.48	0.16
15.50	3.60	1.51	0.15
15.75	3.63	1.53	0.14
16.00	3.65	1.54	0.14
16.25	3.68	1.56	0.13
16.50	3.70	1.58	0.12
16.75	3.72	1.60	0.12
17.00	3.74	1.61	0.12
17.25	3.76	1.63	0.11
17.50	3.78	1.64	0.11
17.75	3.80	1.66	0.11
18.00	3.82	1.67	0.10
18.25	3.84	1.69	0.10
18.50	3.86	1.70	0.10
18.75	3.88	1.72	0.09
19.00	3.89	1.73	0.09
19.25	3.91	1.74	0.09
19.50	3.92	1.75	0.08
19.75	3.94	1.76	0.08
20.00	**3.95**	**1.77**	0.08

Summary for Subcatchment 18S: DA-3

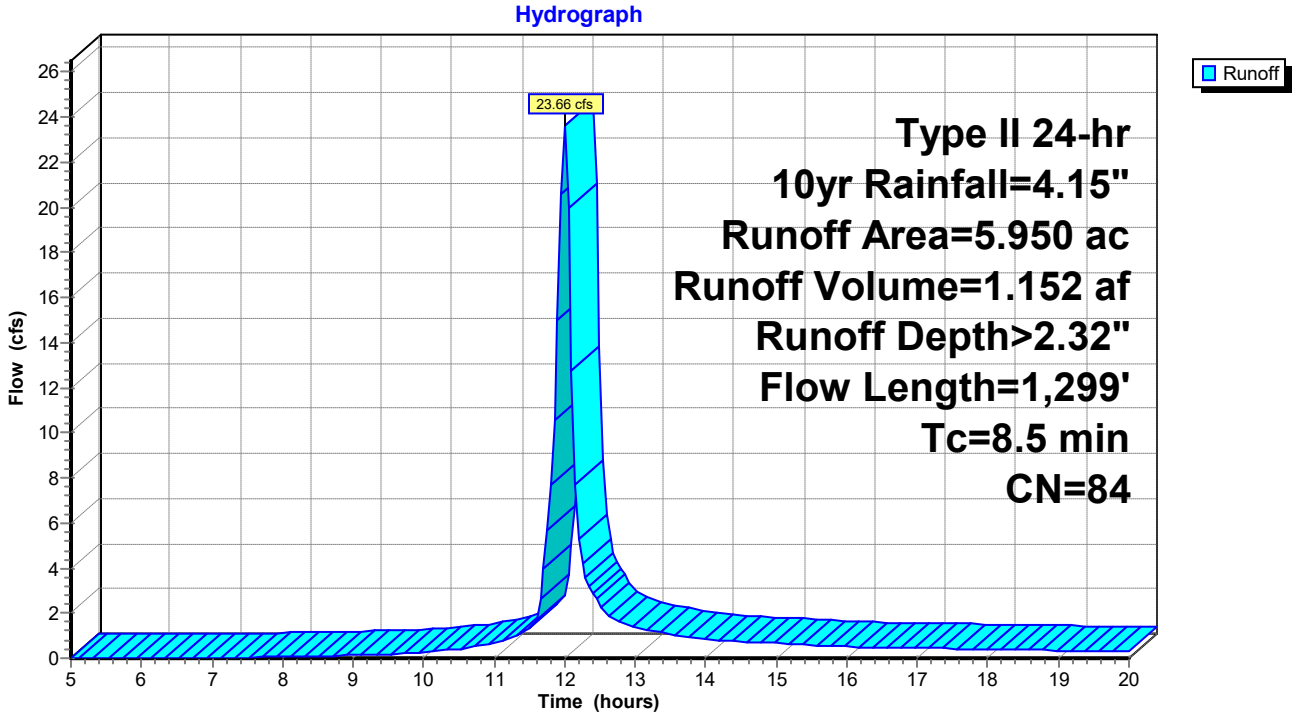
Runoff = 23.66 cfs @ 12.00 hrs, Volume= 1.152 af, Depth> 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
3.757	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
5.950	84	Weighted Average
5.950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	412	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	330	0.0320	2.28	3.19	**Channel Flow,** Area= 1.4 sf Perim= 5.3' r= 0.26' n= 0.048
2.7	557	0.0200	3.47	10.08	**Channel Flow,** Area= 2.9 sf Perim= 5.6' r= 0.52' n= 0.039
8.5	1,299	Total			

Subcatchment 18S: DA-3



Hydrograph for Subcatchment 18S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.00
6.75	0.39	0.00	0.00
7.00	0.41	0.00	0.01
7.25	0.43	0.00	0.02
7.50	0.45	0.00	0.03
7.75	0.48	0.00	0.04
8.00	0.50	0.01	0.06
8.25	0.52	0.01	0.07
8.50	0.55	0.01	0.09
8.75	0.58	0.02	0.12
9.00	0.61	0.02	0.15
9.25	0.64	0.03	0.17
9.50	0.68	0.04	0.19
9.75	0.71	0.05	0.22
10.00	0.75	0.06	0.27
10.25	0.80	0.07	0.33
10.50	0.85	0.09	0.41
10.75	0.91	0.11	0.52
11.00	0.98	0.14	0.67
11.25	1.06	0.18	0.91
11.50	1.17	0.23	1.28
11.75	1.61	0.48	5.68
12.00	2.75	1.31	**23.66**
12.25	2.93	1.46	4.17
12.50	3.05	1.56	2.39
12.75	3.13	1.63	1.68
13.00	3.20	1.69	1.41
13.25	3.26	1.74	1.21
13.50	3.32	1.78	1.06
13.75	3.36	1.82	0.94
14.00	3.40	1.85	0.84
14.25	3.44	1.89	0.77
14.50	3.48	1.92	0.73
14.75	3.51	1.95	0.70
15.00	3.54	1.97	0.66
15.25	3.57	2.00	0.62
15.50	3.60	2.02	0.59
15.75	3.63	2.05	0.55
16.00	3.65	2.07	0.51
16.25	3.68	2.09	0.49
16.50	3.70	2.11	0.48
16.75	3.72	2.13	0.46
17.00	3.74	2.15	0.45
17.25	3.76	2.16	0.44
17.50	3.78	2.18	0.42
17.75	3.80	2.20	0.41
18.00	3.82	2.22	0.40
18.25	3.84	2.23	0.38
18.50	3.86	2.25	0.37
18.75	3.88	2.26	0.36
19.00	3.89	2.28	0.35
19.25	3.91	2.29	0.33
19.50	3.92	2.30	0.32
19.75	3.94	2.32	0.31
20.00	**3.95**	**2.33**	0.29

Summary for Subcatchment 19S: DA-1

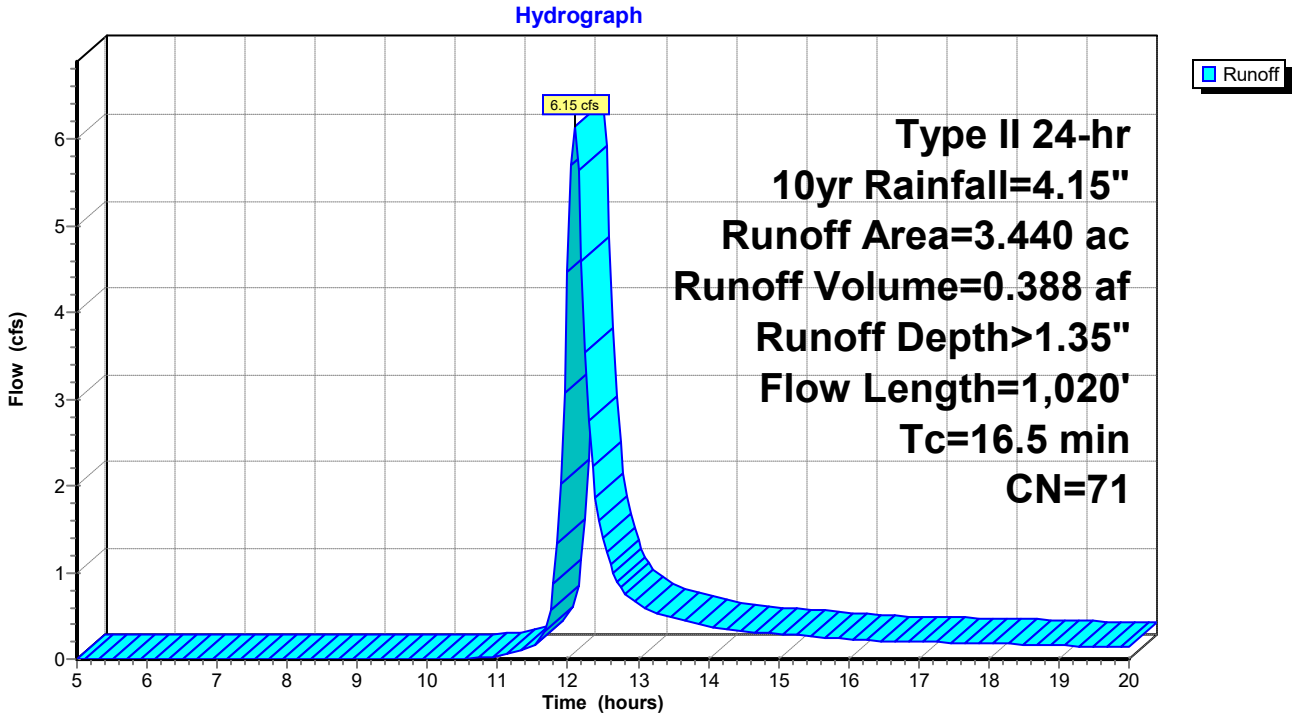
Runoff = 6.15 cfs @ 12.10 hrs, Volume= 0.388 af, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

Area (ac)	CN	Description
3.440	71	Meadow, non-grazed, HSG C
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
9.8	920	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.5	1,020	Total			

Subcatchment 19S: DA-1



Hydrograph for Subcatchment 19S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.00
6.75	0.39	0.00	0.00
7.00	0.41	0.00	0.00
7.25	0.43	0.00	0.00
7.50	0.45	0.00	0.00
7.75	0.48	0.00	0.00
8.00	0.50	0.00	0.00
8.25	0.52	0.00	0.00
8.50	0.55	0.00	0.00
8.75	0.58	0.00	0.00
9.00	0.61	0.00	0.00
9.25	0.64	0.00	0.00
9.50	0.68	0.00	0.00
9.75	0.71	0.00	0.00
10.00	0.75	0.00	0.00
10.25	0.80	0.00	0.00
10.50	0.85	0.00	0.00
10.75	0.91	0.00	0.01
11.00	0.98	0.01	0.04
11.25	1.06	0.01	0.08
11.50	1.17	0.03	0.16
11.75	1.61	0.13	0.57
12.00	2.75	0.62	**4.46**
12.25	2.93	0.72	**3.54**
12.50	3.05	0.79	1.39
12.75	3.13	0.84	0.82
13.00	3.20	0.88	0.64
13.25	3.26	0.92	0.54
13.50	3.32	0.95	0.48
13.75	3.36	0.98	0.42
14.00	3.40	1.00	0.38
14.25	3.44	1.03	0.34
14.50	3.48	1.05	0.32
14.75	3.51	1.07	0.31
15.00	3.54	1.09	0.29
15.25	3.57	1.11	0.28
15.50	3.60	1.13	0.26
15.75	3.63	1.15	0.25
16.00	3.65	1.16	0.23
16.25	3.68	1.18	0.22
16.50	3.70	1.19	0.21
16.75	3.72	1.21	0.21
17.00	3.74	1.22	0.20
17.25	3.76	1.23	0.19
17.50	3.78	1.25	0.19
17.75	3.80	1.26	0.18
18.00	3.82	1.27	0.18
18.25	3.84	1.29	0.17
18.50	3.86	1.30	0.17
18.75	3.88	1.31	0.16
19.00	3.89	1.32	0.16
19.25	3.91	1.33	0.15
19.50	3.92	1.34	0.14
19.75	3.94	1.35	0.14
20.00	**3.95**	**1.36**	0.13

Summary for Subcatchment 20S: DA-4

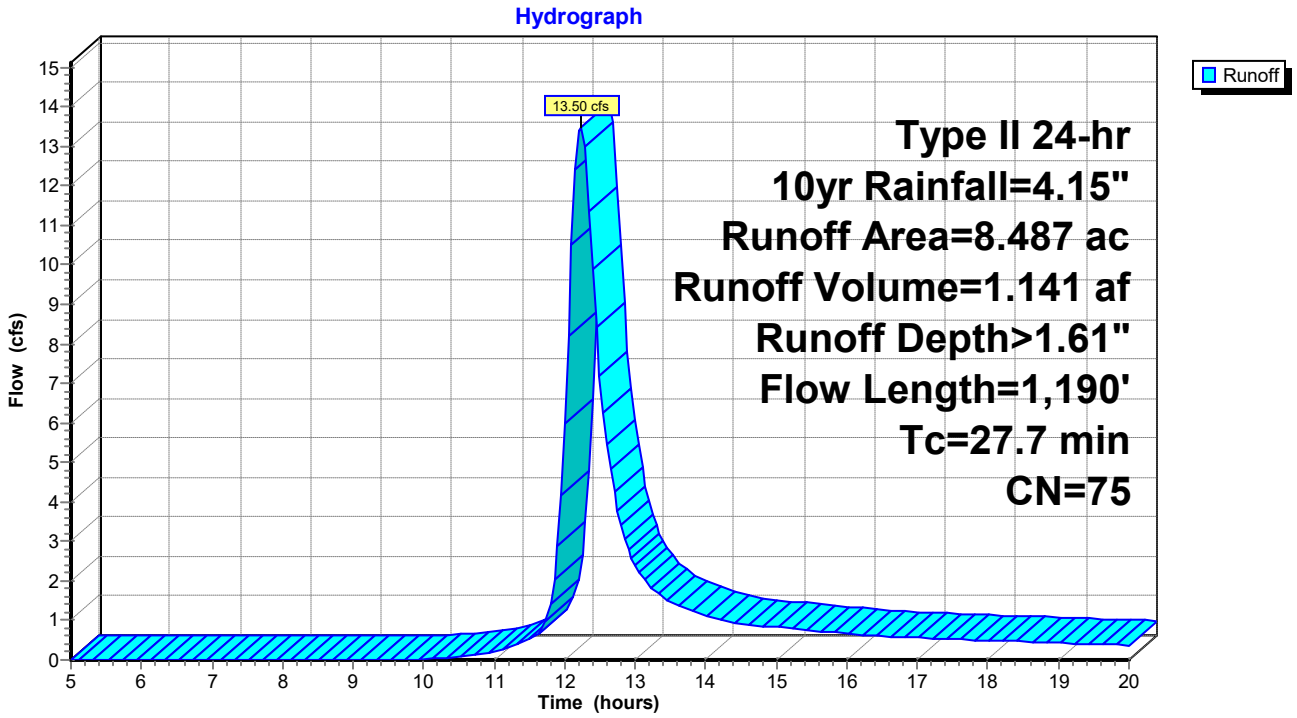
Runoff = 13.50 cfs @ 12.22 hrs, Volume= 1.141 af, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=4.15"

Area (ac)	CN	Description
3.538	71	Meadow, non-grazed, HSG C
4.312	78	Meadow, non-grazed, HSG D
0.427	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.487	75	Weighted Average
8.487		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
4.4	370	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	526	0.0250	1.56	1.87	**Channel Flow,** Area= 1.2 sf Perim= 4.9' r= 0.24' n= 0.059
2.0	194	0.0510	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.7	1,190	Total			

Subcatchment 20S: DA-4



Hydrograph for Subcatchment 20S: DA-4

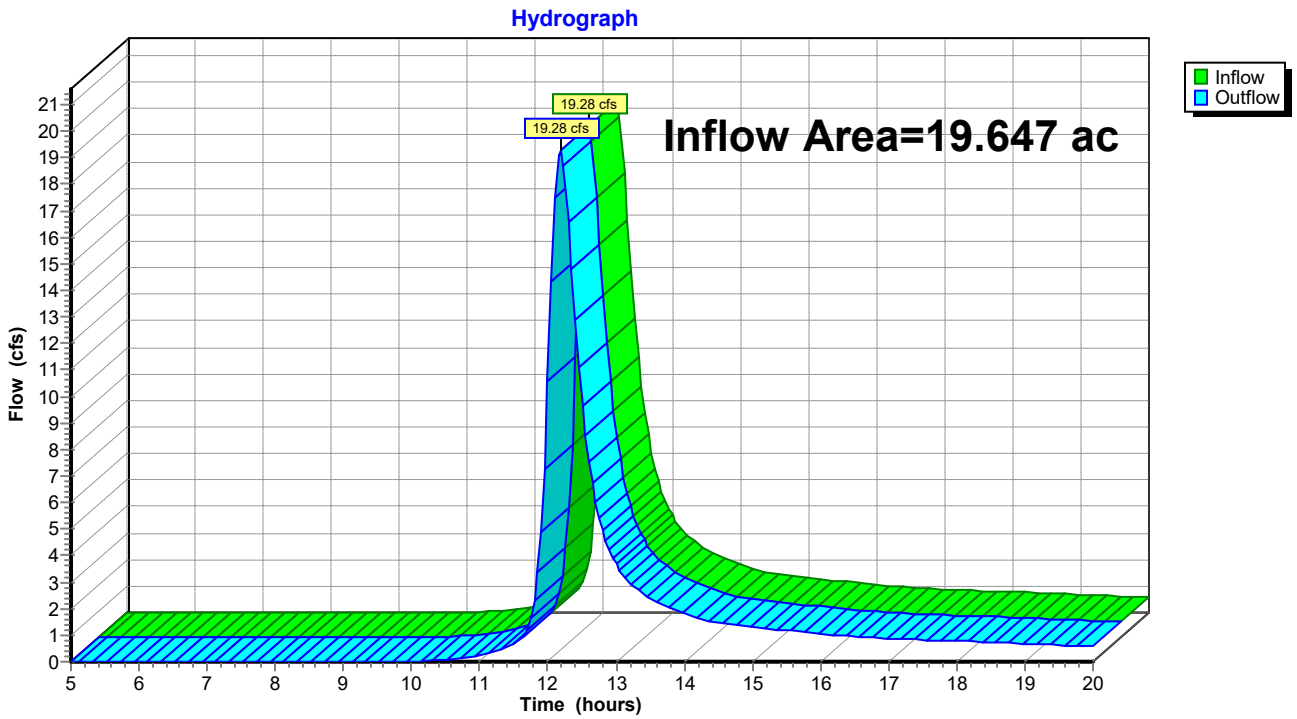
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.26	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.31	0.00	0.00
6.00	0.33	0.00	0.00
6.25	0.35	0.00	0.00
6.50	0.37	0.00	0.00
6.75	0.39	0.00	0.00
7.00	0.41	0.00	0.00
7.25	0.43	0.00	0.00
7.50	0.45	0.00	0.00
7.75	0.48	0.00	0.00
8.00	0.50	0.00	0.00
8.25	0.52	0.00	0.00
8.50	0.55	0.00	0.00
8.75	0.58	0.00	0.00
9.00	0.61	0.00	0.00
9.25	0.64	0.00	0.00
9.50	0.68	0.00	0.00
9.75	0.71	0.00	0.00
10.00	0.75	0.00	0.02
10.25	0.80	0.00	0.05
10.50	0.85	0.01	0.09
10.75	0.91	0.02	0.14
11.00	0.98	0.03	0.22
11.25	1.06	0.04	0.33
11.50	1.17	0.07	0.52
11.75	1.61	0.21	1.07
12.00	2.75	0.80	**6.00**
12.25	2.93	0.92	**13.37**
12.50	3.05	0.99	7.20
12.75	3.13	1.05	3.79
13.00	3.20	1.10	2.39
13.25	3.26	1.14	1.79
13.50	3.32	1.17	1.46
13.75	3.36	1.21	1.28
14.00	3.40	1.23	1.13
14.25	3.44	1.26	1.01
14.50	3.48	1.28	0.92
14.75	3.51	1.31	0.87
15.00	3.54	1.33	0.83
15.25	3.57	1.35	0.79
15.50	3.60	1.37	0.75
15.75	3.63	1.39	0.70
16.00	3.65	1.41	0.66
16.25	3.68	1.43	0.62
16.50	3.70	1.44	0.59
16.75	3.72	1.46	0.57
17.00	3.74	1.48	0.56
17.25	3.76	1.49	0.54
17.50	3.78	1.51	0.53
17.75	3.80	1.52	0.51
18.00	3.82	1.53	0.50
18.25	3.84	1.55	0.48
18.50	3.86	1.56	0.47
18.75	3.88	1.57	0.45
19.00	3.89	1.59	0.44
19.25	3.91	1.60	0.42
19.50	3.92	1.61	0.40
19.75	3.94	1.62	0.39
20.00	**3.95**	**1.63**	0.37

Summary for Reach 6R: Reach

Inflow Area = 19.647 ac, 0.00% Impervious, Inflow Depth > 1.05" for 10yr event
Inflow = 19.28 cfs @ 12.18 hrs, Volume= 1.713 af
Outflow = 19.28 cfs @ 12.18 hrs, Volume= 1.713 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Reach



Hydrograph for Reach 6R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	0.81		0.81
5.25	0.00		0.00	18.00	0.78		0.78
5.50	0.00		0.00	18.25	0.76		0.76
5.75	0.00		0.00	18.50	0.73		0.73
6.00	0.00		0.00	18.75	0.71		0.71
6.25	0.00		0.00	19.00	0.68		0.68
6.50	0.00		0.00	19.25	0.66		0.66
6.75	0.00		0.00	19.50	0.63		0.63
7.00	0.00		0.00	19.75	0.61		0.61
7.25	0.00		0.00	20.00	0.58		0.58
7.50	0.00		0.00				
7.75	0.00		0.00				
8.00	0.00		0.00				
8.25	0.00		0.00				
8.50	0.00		0.00				
8.75	0.00		0.00				
9.00	0.00		0.00				
9.25	0.00		0.00				
9.50	0.00		0.00				
9.75	0.00		0.00				
10.00	0.02		0.02				
10.25	0.05		0.05				
10.50	0.09		0.09				
10.75	0.15		0.15				
11.00	0.26		0.26				
11.25	0.41		0.41				
11.50	0.68		0.68				
11.75	1.64		1.64				
12.00	**10.55**		**10.55**				
12.25	**18.15**		**18.15**				
12.50	9.66		9.66				
12.75	5.43		5.43				
13.00	3.67		3.67				
13.25	2.85		2.85				
13.50	2.37		2.37				
13.75	2.06		2.06				
14.00	1.82		1.82				
14.25	1.62		1.62				
14.50	1.49		1.49				
14.75	1.40		1.40				
15.00	1.32		1.32				
15.25	1.25		1.25				
15.50	1.18		1.18				
15.75	1.12		1.12				
16.00	1.05		1.05				
16.25	0.98		0.98				
16.50	0.94		0.94				
16.75	0.91		0.91				
17.00	0.88		0.88				
17.25	0.86		0.86				
17.50	0.83		0.83				

Summary for Pond 11P: Infiltration basin

Inflow Area =	1.770 ac,	0.00% Impervious,	Inflow Depth >	1.77"	for 10yr event
Inflow =	4.99 cfs @	12.03 hrs,	Volume=	0.261 af	
Outflow =	1.27 cfs @	12.27 hrs,	Volume=	0.194 af,	Atten= 75%, Lag= 14.3 min
Discarded =	0.02 cfs @	12.27 hrs,	Volume=	0.010 af	
Primary =	1.25 cfs @	12.27 hrs,	Volume=	0.184 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,276.57' @ 12.27 hrs Surf.Area= 5,971 sf Storage= 5,127 cf

Plug-Flow detention time= 123.0 min calculated for 0.194 af (75% of inflow)
Center-of-Mass det. time= 58.6 min (854.3 - 795.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,275.00'	17,576 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

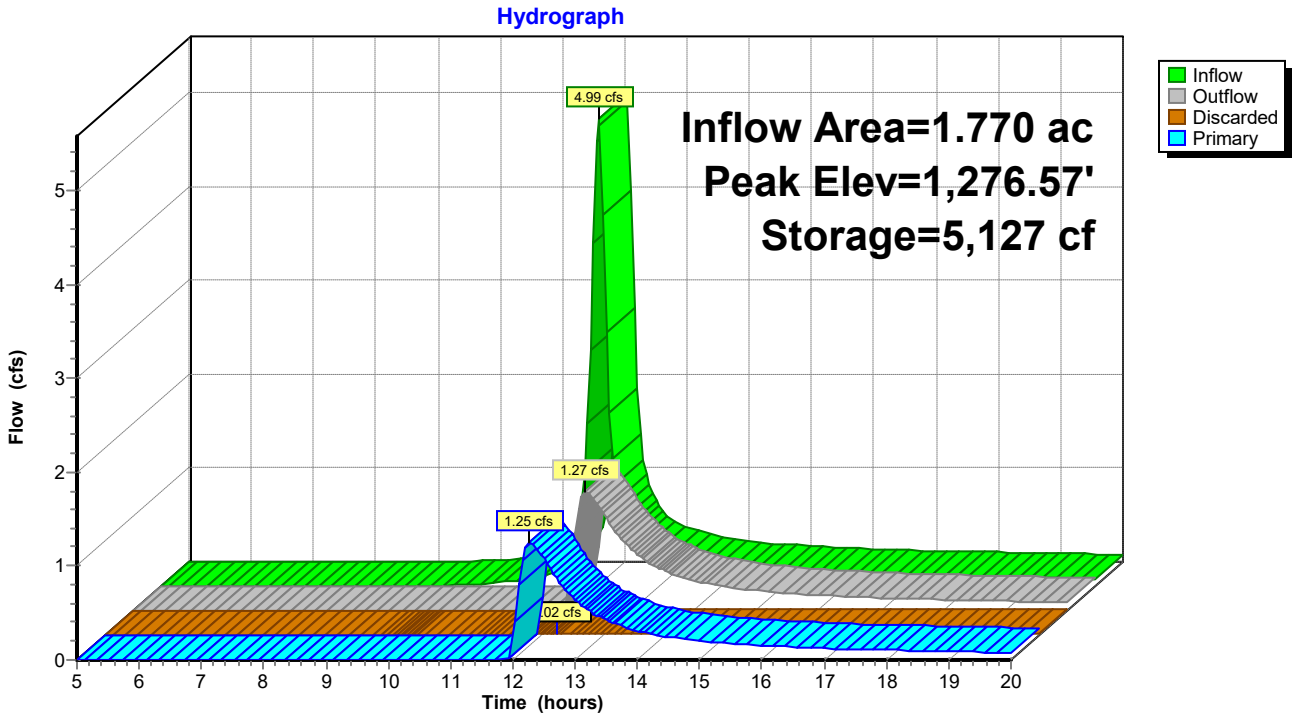
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,275.00	898	0	0
1,276.00	3,791	2,345	2,345
1,278.00	11,440	15,231	17,576

Device	Routing	Invert	Outlet Devices
#1	Primary	1,276.00'	**18.0" Round Pipe** L= 25.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,276.00' / 1,272.00' S= 0.1600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	1,275.00'	**0.125 in/hr Exfiltration over Surface area**
#3	Primary	1,277.00'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

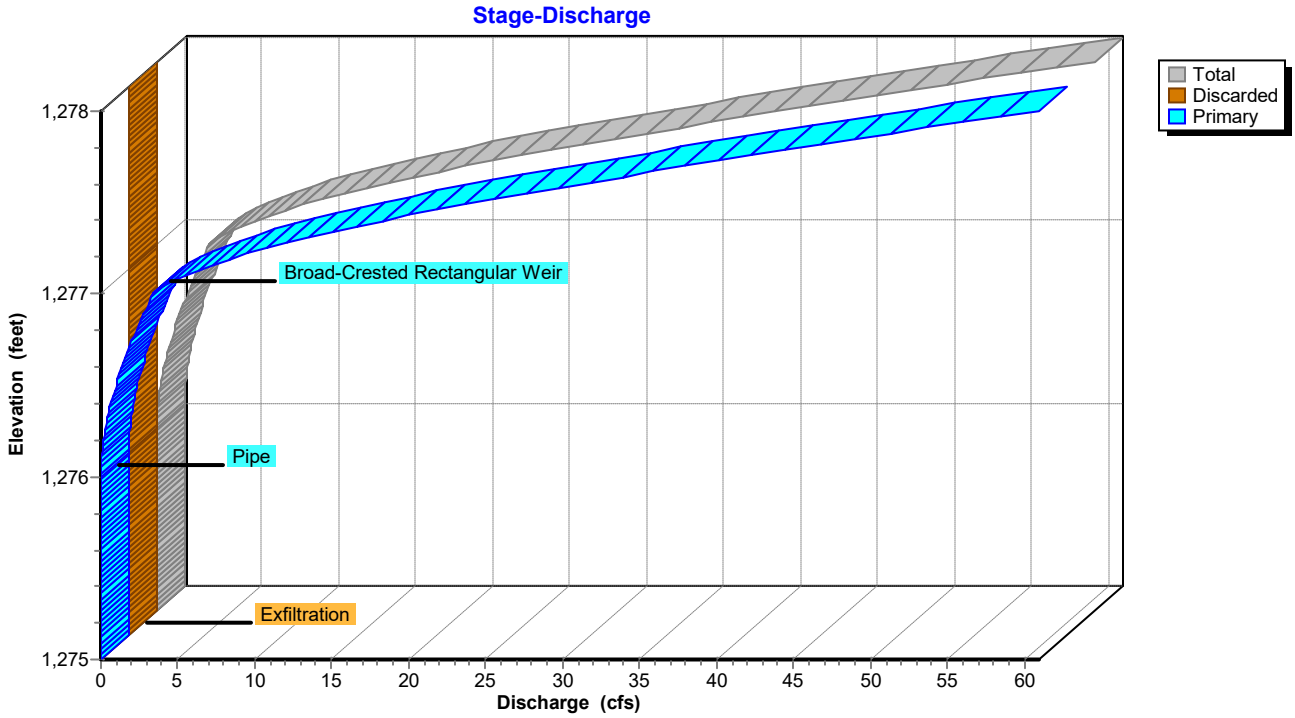
Discarded OutFlow Max=0.02 cfs @ 12.27 hrs HW=1,276.57' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.24 cfs @ 12.27 hrs HW=1,276.57' (Free Discharge)
├─**1=Pipe** (Inlet Controls 1.24 cfs @ 2.03 fps)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: Infiltration basin



Pond 11P: Infiltration basin



Hydrograph for Pond 11P: Infiltration basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.00	0.00	0	1,275.00	0.00	0.00	0.00
5.50	0.00	0	1,275.00	0.00	0.00	0.00
6.00	0.00	0	1,275.00	0.00	0.00	0.00
6.50	0.00	0	1,275.00	0.00	0.00	0.00
7.00	0.00	0	1,275.00	0.00	0.00	0.00
7.50	0.00	0	1,275.00	0.00	0.00	0.00
8.00	0.00	0	1,275.00	0.00	0.00	0.00
8.50	0.00	0	1,275.00	0.00	0.00	0.00
9.00	0.00	0	1,275.00	0.00	0.00	0.00
9.50	0.01	7	1,275.01	0.00	0.00	0.00
10.00	0.02	30	1,275.03	0.00	0.00	0.00
10.50	0.05	84	1,275.08	0.00	0.00	0.00
11.00	0.09	196	1,275.17	0.00	0.00	0.00
11.50	0.20	437	1,275.32	0.01	0.01	0.00
12.00	**4.76**	**2,921**	**1,276.14**	**0.10**	**0.01**	**0.09**
12.50	**0.66**	**4,863**	**1,276.53**	**1.09**	**0.02**	**1.07**
13.00	0.37	4,164	1,276.40	0.66	0.02	0.64
13.50	0.28	3,767	1,276.32	0.44	0.01	0.43
14.00	0.22	3,529	1,276.27	0.33	0.01	0.31
14.50	0.19	3,371	1,276.24	0.26	0.01	0.24
15.00	0.17	3,273	1,276.22	0.22	0.01	0.20
15.50	0.15	3,201	1,276.20	0.19	0.01	0.18
16.00	0.14	3,140	1,276.19	0.17	0.01	0.15
16.50	0.12	3,086	1,276.18	0.15	0.01	0.14
17.00	0.12	3,048	1,276.17	0.14	0.01	0.12
17.50	0.11	3,017	1,276.16	0.13	0.01	0.11
18.00	0.10	2,990	1,276.16	0.12	0.01	0.11
18.50	0.10	2,965	1,276.15	0.11	0.01	0.10
19.00	0.09	2,941	1,276.15	0.10	0.01	0.09
19.50	0.08	2,917	1,276.14	0.10	0.01	0.08
20.00	0.08	2,893	1,276.14	0.09	0.01	0.08

Stage-Discharge for Pond 11P: Infiltration basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
1,275.00	0.00	0.00	0.00
1,275.05	0.00	0.00	0.00
1,275.10	0.00	0.00	0.00
1,275.15	0.00	0.00	0.00
1,275.20	0.00	0.00	0.00
1,275.25	0.00	0.00	0.00
1,275.30	0.01	0.01	0.00
1,275.35	0.01	0.01	0.00
1,275.40	0.01	0.01	0.00
1,275.45	0.01	0.01	0.00
1,275.50	0.01	0.01	0.00
1,275.55	0.01	0.01	0.00
1,275.60	0.01	0.01	0.00
1,275.65	0.01	0.01	0.00
1,275.70	0.01	0.01	0.00
1,275.75	0.01	0.01	0.00
1,275.80	0.01	0.01	0.00
1,275.85	0.01	0.01	0.00
1,275.90	0.01	0.01	0.00
1,275.95	0.01	0.01	0.00
1,276.00	0.01	0.01	0.00
1,276.05	0.02	0.01	0.01
1,276.10	0.06	0.01	0.04
1,276.15	0.11	0.01	0.10
1,276.20	0.18	0.01	0.17
1,276.25	0.27	0.01	0.26
1,276.30	0.38	0.01	0.37
1,276.35	0.51	0.01	0.50
1,276.40	0.66	0.02	0.64
1,276.45	0.82	0.02	0.80
1,276.50	1.00	0.02	0.98
1,276.55	1.19	0.02	1.17
1,276.60	1.39	0.02	1.37
1,276.65	1.61	0.02	1.59
1,276.70	1.84	0.02	1.82
1,276.75	2.08	0.02	2.06
1,276.80	2.32	0.02	2.30
1,276.85	2.58	0.02	2.56
1,276.90	2.84	0.02	2.82
1,276.95	3.11	0.02	3.09
1,277.00	3.39	0.02	3.36
1,277.05	4.19	0.02	4.17
1,277.10	5.44	0.02	5.42
1,277.15	6.98	0.02	6.96
1,277.20	8.74	0.02	8.72
1,277.25	10.80	0.02	10.78
1,277.30	13.10	0.03	13.07
1,277.35	15.61	0.03	15.58
1,277.40	18.34	0.03	18.31
1,277.45	21.25	0.03	21.22
1,277.50	24.34	0.03	24.31
1,277.55	27.68	0.03	27.65
1,277.60	31.23	0.03	31.20
1,277.65	34.57	0.03	34.54
1,277.70	38.03	0.03	38.00
1,277.75	41.59	0.03	41.56
1,277.80	45.27	0.03	45.24
1,277.85	49.04	0.03	49.01
1,277.90	52.91	0.03	52.88
1,277.95	56.88	0.03	56.85
1,278.00	**60.94**	**0.03**	**60.91**

Stage-Area-Storage for Pond 11P: Infiltration basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,275.00	898	0
1,275.05	1,043	49
1,275.10	1,187	104
1,275.15	1,332	167
1,275.20	1,477	237
1,275.25	1,621	315
1,275.30	1,766	400
1,275.35	1,911	491
1,275.40	2,055	591
1,275.45	2,200	697
1,275.50	2,345	811
1,275.55	2,489	931
1,275.60	2,634	1,060
1,275.65	2,778	1,195
1,275.70	2,923	1,337
1,275.75	3,068	1,487
1,275.80	3,212	1,644
1,275.85	3,357	1,808
1,275.90	3,502	1,980
1,275.95	3,646	2,159
1,276.00	3,791	2,345
1,276.05	3,982	2,539
1,276.10	4,173	2,743
1,276.15	4,365	2,956
1,276.20	4,556	3,179
1,276.25	4,747	3,412
1,276.30	4,938	3,654
1,276.35	5,130	3,906
1,276.40	5,321	4,167
1,276.45	5,512	4,438
1,276.50	5,703	4,718
1,276.55	5,894	5,008
1,276.60	6,086	5,308
1,276.65	6,277	5,617
1,276.70	6,468	5,935
1,276.75	6,659	6,263
1,276.80	6,851	6,601
1,276.85	7,042	6,948
1,276.90	7,233	7,305
1,276.95	7,424	7,672
1,277.00	7,616	8,048
1,277.05	7,807	8,433
1,277.10	7,998	8,828
1,277.15	8,189	9,233
1,277.20	8,380	9,647
1,277.25	8,572	10,071
1,277.30	8,763	10,505
1,277.35	8,954	10,947
1,277.40	9,145	11,400
1,277.45	9,337	11,862
1,277.50	9,528	12,334
1,277.55	9,719	12,815
1,277.60	9,910	13,305
1,277.65	10,101	13,806
1,277.70	10,293	14,316
1,277.75	10,484	14,835
1,277.80	10,675	15,364
1,277.85	10,866	15,903
1,277.90	11,058	16,451
1,277.95	11,249	17,008
1,278.00	**11,440**	**17,576**

Summary for Pond 13P: Wet Pond

Inflow Area =	5.950 ac,	0.00% Impervious,	Inflow Depth >	2.32"	for 10yr event
Inflow =	23.66 cfs @	12.00 hrs,	Volume=	1.152 af	
Outflow =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af,	Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	
Secondary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,290.46' @ 20.00 hrs Surf.Area= 28,706 sf Storage= 50,140 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,288.50'	214,237 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

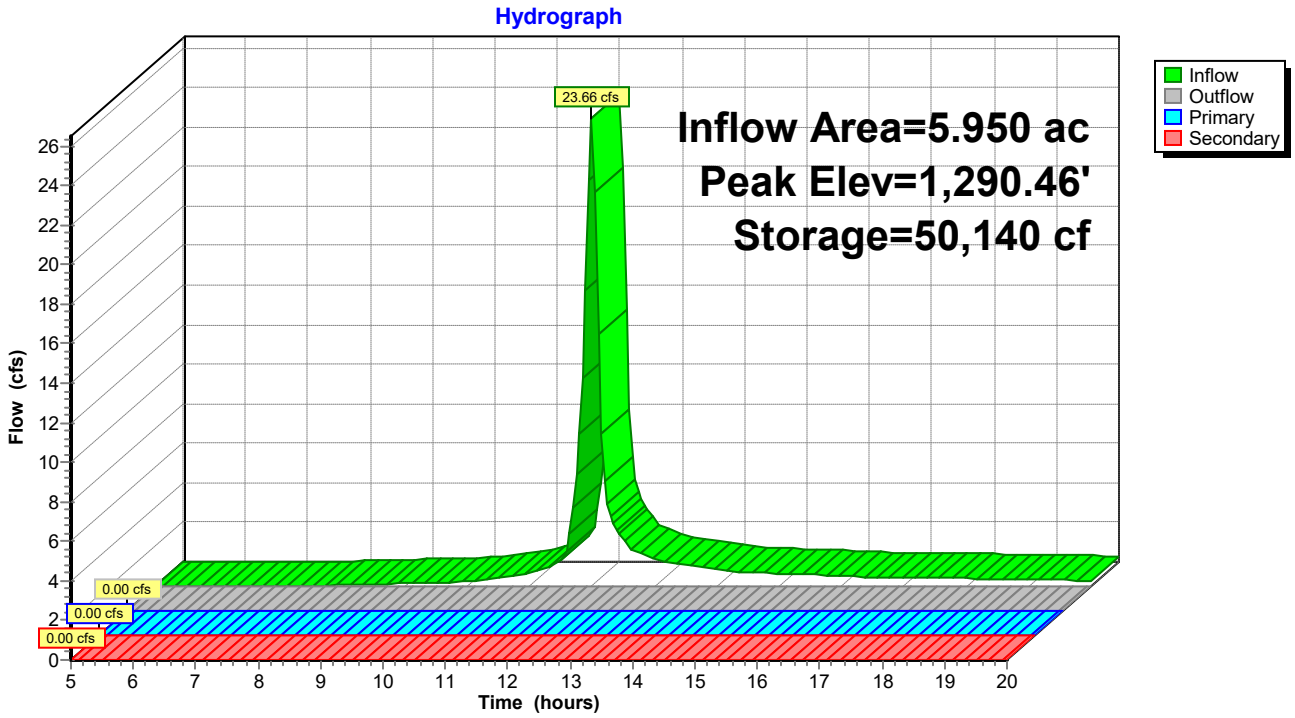
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,288.50	22,471	0	0
1,290.00	27,127	37,199	37,199
1,292.00	33,940	61,067	98,266
1,294.00	40,276	74,216	172,482
1,295.00	43,234	41,755	214,237

Device	Routing	Invert	Outlet Devices
#1	Primary	1,289.50'	**15.0" Round Pipe** L= 100.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,289.50' / 1,289.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,290.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,291.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1,292.00'	**1.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	1,293.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

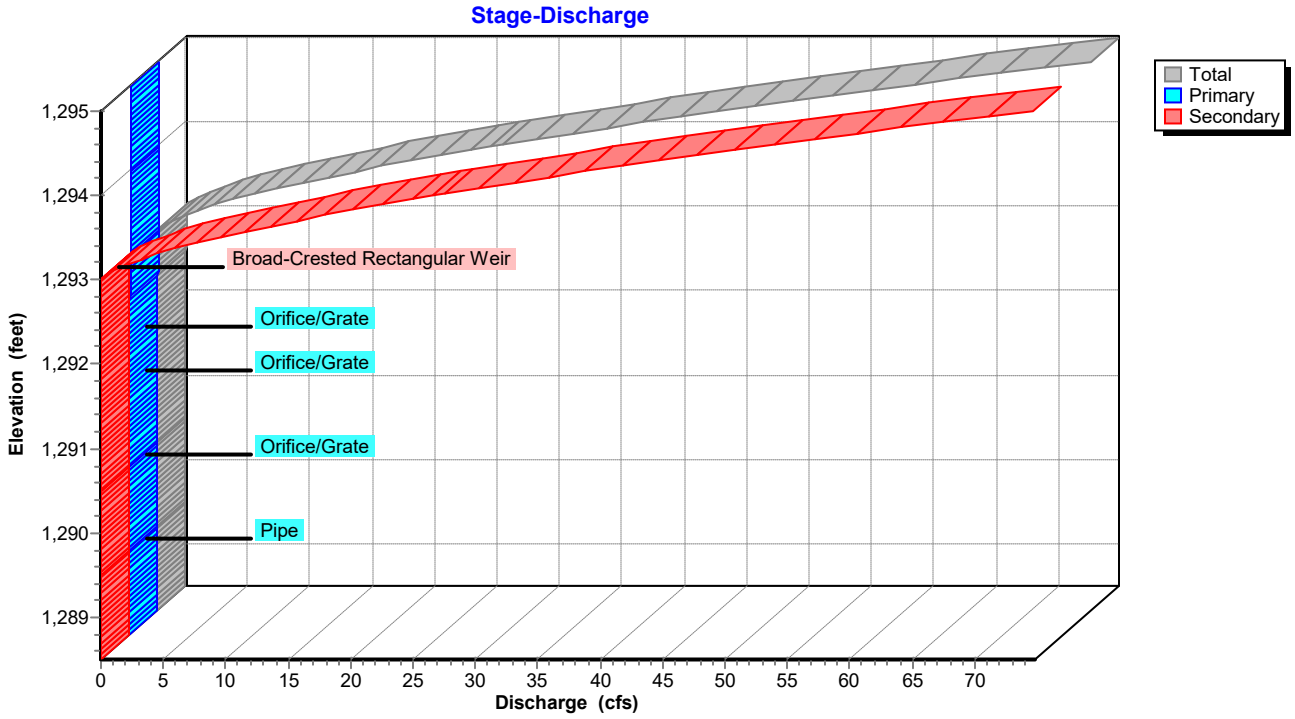
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**1=Pipe** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 13P: Wet Pond



Pond 13P: Wet Pond



Hydrograph for Pond 13P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.00	0.00	0	1,288.50	**0.00**	**0.00**	**0.00**
5.50	0.00	0	1,288.50	0.00	0.00	0.00
6.00	0.00	0	1,288.50	0.00	0.00	0.00
6.50	0.00	0	1,288.50	0.00	0.00	0.00
7.00	0.01	4	1,288.50	0.00	0.00	0.00
7.50	0.03	41	1,288.50	0.00	0.00	0.00
8.00	0.06	119	1,288.51	0.00	0.00	0.00
8.50	0.09	248	1,288.51	0.00	0.00	0.00
9.00	0.15	460	1,288.52	0.00	0.00	0.00
9.50	0.19	766	1,288.53	0.00	0.00	0.00
10.00	0.27	1,169	1,288.55	0.00	0.00	0.00
10.50	0.41	1,773	1,288.58	0.00	0.00	0.00
11.00	0.67	2,723	1,288.62	0.00	0.00	0.00
11.50	1.28	4,397	1,288.69	0.00	0.00	0.00
12.00	**23.66**	19,105	1,289.31	0.00	0.00	0.00
12.50	2.39	32,617	1,289.83	0.00	0.00	0.00
13.00	1.41	35,762	1,289.95	0.00	0.00	0.00
13.50	1.06	37,951	1,290.03	0.00	0.00	0.00
14.00	0.84	39,650	1,290.09	0.00	0.00	0.00
14.50	0.73	41,041	1,290.14	0.00	0.00	0.00
15.00	0.66	42,294	1,290.19	0.00	0.00	0.00
15.50	0.59	43,418	1,290.23	0.00	0.00	0.00
16.00	0.51	44,410	1,290.26	0.00	0.00	0.00
16.50	0.48	45,294	1,290.29	0.00	0.00	0.00
17.00	0.45	46,128	1,290.32	0.00	0.00	0.00
17.50	0.42	46,915	1,290.35	0.00	0.00	0.00
18.00	0.40	47,656	1,290.38	0.00	0.00	0.00
18.50	0.37	48,349	1,290.40	0.00	0.00	0.00
19.00	0.35	48,994	1,290.42	0.00	0.00	0.00
19.50	0.32	49,591	1,290.44	0.00	0.00	0.00
20.00	0.29	**50,140**	**1,290.46**	0.00	0.00	0.00

Stage-Discharge for Pond 13P: Wet Pond

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
1,288.50	0.00	0.00	0.00
1,288.60	0.00	0.00	0.00
1,288.70	0.00	0.00	0.00
1,288.80	0.00	0.00	0.00
1,288.90	0.00	0.00	0.00
1,289.00	0.00	0.00	0.00
1,289.10	0.00	0.00	0.00
1,289.20	0.00	0.00	0.00
1,289.30	0.00	0.00	0.00
1,289.40	0.00	0.00	0.00
1,289.50	0.00	0.00	0.00
1,289.60	0.00	0.00	0.00
1,289.70	0.00	0.00	0.00
1,289.80	0.00	0.00	0.00
1,289.90	0.00	0.00	0.00
1,290.00	0.00	0.00	0.00
1,290.10	0.00	0.00	0.00
1,290.20	0.00	0.00	0.00
1,290.30	0.00	0.00	0.00
1,290.40	0.00	0.00	0.00
1,290.50	0.00	0.00	0.00
1,290.60	0.01	0.01	0.00
1,290.70	0.01	0.01	0.00
1,290.80	0.01	0.01	0.00
1,290.90	0.02	0.02	0.00
1,291.00	0.02	0.02	0.00
1,291.10	0.02	0.02	0.00
1,291.20	0.02	0.02	0.00
1,291.30	0.02	0.02	0.00
1,291.40	0.02	0.02	0.00
1,291.50	0.03	0.03	0.00
1,291.60	0.03	0.03	0.00
1,291.70	0.04	0.04	0.00
1,291.80	0.04	0.04	0.00
1,291.90	0.05	0.05	0.00
1,292.00	0.05	0.05	0.00
1,292.10	0.06	0.06	0.00
1,292.20	0.07	0.07	0.00
1,292.30	0.07	0.07	0.00
1,292.40	0.08	0.08	0.00
1,292.50	0.08	0.08	0.00
1,292.60	0.08	0.08	0.00
1,292.70	0.09	0.09	0.00
1,292.80	0.09	0.09	0.00
1,292.90	0.10	0.10	0.00
1,293.00	0.10	0.10	0.00
1,293.10	0.91	0.10	0.81
1,293.20	2.40	0.10	2.30
1,293.30	4.37	0.11	4.26
1,293.40	6.74	0.11	6.63
1,293.50	9.52	0.11	9.40
1,293.60	12.66	0.12	12.55
1,293.70	15.84	0.12	15.73
1,293.80	19.23	0.12	19.10
1,293.90	22.88	0.12	22.75
1,294.00	26.73	0.13	26.60
1,294.10	30.88	0.13	30.75
1,294.20	35.23	0.13	35.10
1,294.30	39.64	0.13	39.50
1,294.40	44.20	0.14	44.06
1,294.50	48.82	0.14	48.68
1,294.60	53.57	0.14	53.43
1,294.70	58.66	0.14	58.52
1,294.80	63.90	0.15	63.75
1,294.90	69.29	0.15	69.14
1,295.00	**74.82**	**0.15**	**74.67**

Stage-Area-Storage for Pond 13P: Wet Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,288.50	22,471	0
1,288.60	22,781	2,263
1,288.70	23,092	4,556
1,288.80	23,402	6,881
1,288.90	23,713	9,237
1,289.00	24,023	11,624
1,289.10	24,333	14,041
1,289.20	24,644	16,490
1,289.30	24,954	18,970
1,289.40	25,265	21,481
1,289.50	25,575	24,023
1,289.60	25,885	26,596
1,289.70	26,196	29,200
1,289.80	26,506	31,835
1,289.90	26,817	34,501
1,290.00	27,127	37,199
1,290.10	27,468	39,928
1,290.20	27,808	42,692
1,290.30	28,149	45,490
1,290.40	28,490	48,322
1,290.50	28,830	51,188
1,290.60	29,171	54,088
1,290.70	29,512	57,022
1,290.80	29,852	59,990
1,290.90	30,193	62,992
1,291.00	30,534	66,029
1,291.10	30,874	69,099
1,291.20	31,215	72,204
1,291.30	31,555	75,342
1,291.40	31,896	78,515
1,291.50	32,237	81,721
1,291.60	32,577	84,962
1,291.70	32,918	88,237
1,291.80	33,259	91,546
1,291.90	33,599	94,889
1,292.00	33,940	98,266
1,292.10	34,257	101,675
1,292.20	34,574	105,117
1,292.30	34,890	108,590
1,292.40	35,207	112,095
1,292.50	35,524	115,632
1,292.60	35,841	119,200
1,292.70	36,158	122,800
1,292.80	36,474	126,431
1,292.90	36,791	130,095
1,293.00	37,108	133,790
1,293.10	37,425	137,516
1,293.20	37,742	141,274
1,293.30	38,058	145,064
1,293.40	38,375	148,886
1,293.50	38,692	152,740
1,293.60	39,009	156,625
1,293.70	39,326	160,541
1,293.80	39,642	164,490
1,293.90	39,959	168,470
1,294.00	40,276	172,482
1,294.10	40,572	176,524
1,294.20	40,868	180,596
1,294.30	41,163	184,697
1,294.40	41,459	188,829
1,294.50	41,755	192,989
1,294.60	42,051	197,180
1,294.70	42,347	201,399
1,294.80	42,642	205,649
1,294.90	42,938	209,928
1,295.00	**43,234**	**214,237**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 14S: DA-2 Runoff Area=1.770 ac 0.00% Impervious Runoff Depth>2.46"
Flow Length=369' Tc=11.1 min CN=77 Runoff=6.91 cfs 0.363 af

Subcatchment 18S: DA-3 Runoff Area=5.950 ac 0.00% Impervious Runoff Depth>3.10"
Flow Length=1,299' Tc=8.5 min CN=84 Runoff=31.09 cfs 1.536 af

Subcatchment 19S: DA-1 Runoff Area=3.440 ac 0.00% Impervious Runoff Depth>1.97"
Flow Length=1,020' Tc=16.5 min CN=71 Runoff=9.04 cfs 0.564 af

Subcatchment 20S: DA-4 Runoff Area=8.487 ac 0.00% Impervious Runoff Depth>2.28"
Flow Length=1,190' Tc=27.7 min CN=75 Runoff=19.20 cfs 1.612 af

Reach 6R: Reach Inflow=28.53 cfs 2.467 af
Outflow=28.53 cfs 2.467 af

Pond 11P: Infiltration basin Peak Elev=1,276.82' Storage=6,755 cf Inflow=6.91 cfs 0.363 af
Discarded=0.02 cfs 0.011 af Primary=2.42 cfs 0.284 af Outflow=2.44 cfs 0.295 af

Pond 13P: Wet Pond Peak Elev=1,291.02' Storage=66,554 cf Inflow=31.09 cfs 1.536 af
Primary=0.02 cfs 0.007 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.007 af

Total Runoff Area = 19.647 ac Runoff Volume = 4.075 af Average Runoff Depth = 2.49"
100.00% Pervious = 19.647 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 14S: DA-2

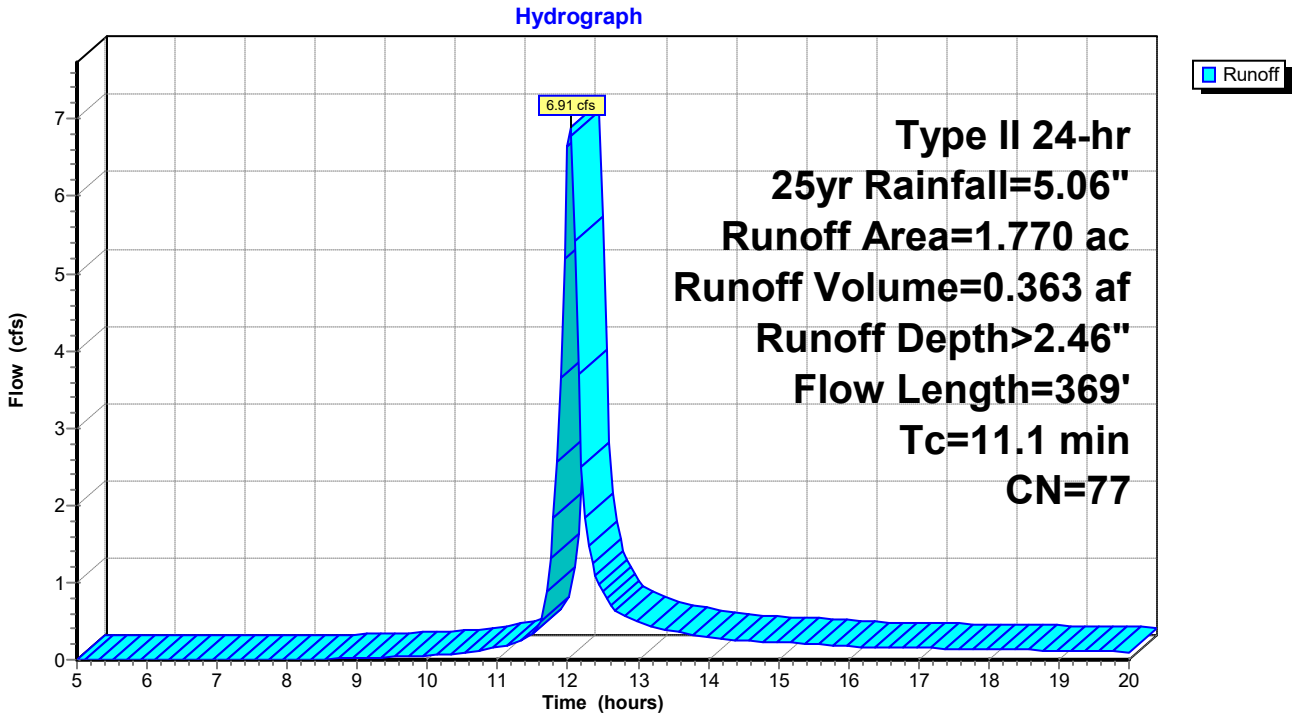
Runoff = 6.91 cfs @ 12.03 hrs, Volume= 0.363 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=5.06"

	Area (ac)	CN	Description
*	0.545	89	Gravel, HSG C
	1.225	71	Meadow, non-grazed, HSG C
	1.770	77	Weighted Average
	1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	175	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	54	0.0750	1.37		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.1	369	Total			

Subcatchment 14S: DA-2



Hydrograph for Subcatchment 14S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.32	0.00	0.00
5.25	0.34	0.00	0.00
5.50	0.36	0.00	0.00
5.75	0.38	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.43	0.00	0.00
6.50	0.45	0.00	0.00
6.75	0.48	0.00	0.00
7.00	0.50	0.00	0.00
7.25	0.53	0.00	0.00
7.50	0.55	0.00	0.00
7.75	0.58	0.00	0.00
8.00	0.61	0.00	0.00
8.25	0.64	0.00	0.00
8.50	0.67	0.00	0.01
8.75	0.70	0.00	0.01
9.00	0.74	0.01	0.02
9.25	0.78	0.01	0.03
9.50	0.82	0.02	0.04
9.75	0.87	0.02	0.04
10.00	0.92	0.03	0.06
10.25	0.97	0.04	0.07
10.50	1.03	0.06	0.09
10.75	1.10	0.07	0.12
11.00	1.19	0.10	0.16
11.25	1.30	0.13	0.23
11.50	1.43	0.18	0.34
11.75	1.96	0.43	1.31
12.00	3.35	1.32	**6.63**
12.25	3.57	1.48	**1.84**
12.50	3.72	1.60	0.87
12.75	3.82	1.67	0.58
13.00	3.91	1.74	0.49
13.25	3.98	1.80	0.41
13.50	4.04	1.85	0.37
13.75	4.10	1.89	0.32
14.00	4.15	1.93	0.29
14.25	4.19	1.97	0.26
14.50	4.24	2.00	0.25
14.75	4.28	2.03	0.24
15.00	4.32	2.06	0.23
15.25	4.36	2.09	0.21
15.50	4.39	2.12	0.20
15.75	4.42	2.15	0.19
16.00	4.45	2.17	0.18
16.25	4.48	2.20	0.17
16.50	4.51	2.22	0.16
16.75	4.54	2.24	0.16
17.00	4.56	2.26	0.15
17.25	4.59	2.28	0.15
17.50	4.61	2.30	0.15
17.75	4.64	2.32	0.14
18.00	4.66	2.34	0.14
18.25	4.68	2.36	0.13
18.50	4.70	2.38	0.13
18.75	4.73	2.39	0.12
19.00	4.75	2.41	0.12
19.25	4.76	2.43	0.11
19.50	4.78	2.44	0.11
19.75	4.80	2.46	0.10
20.00	**4.82**	**2.47**	0.10

Summary for Subcatchment 18S: DA-3

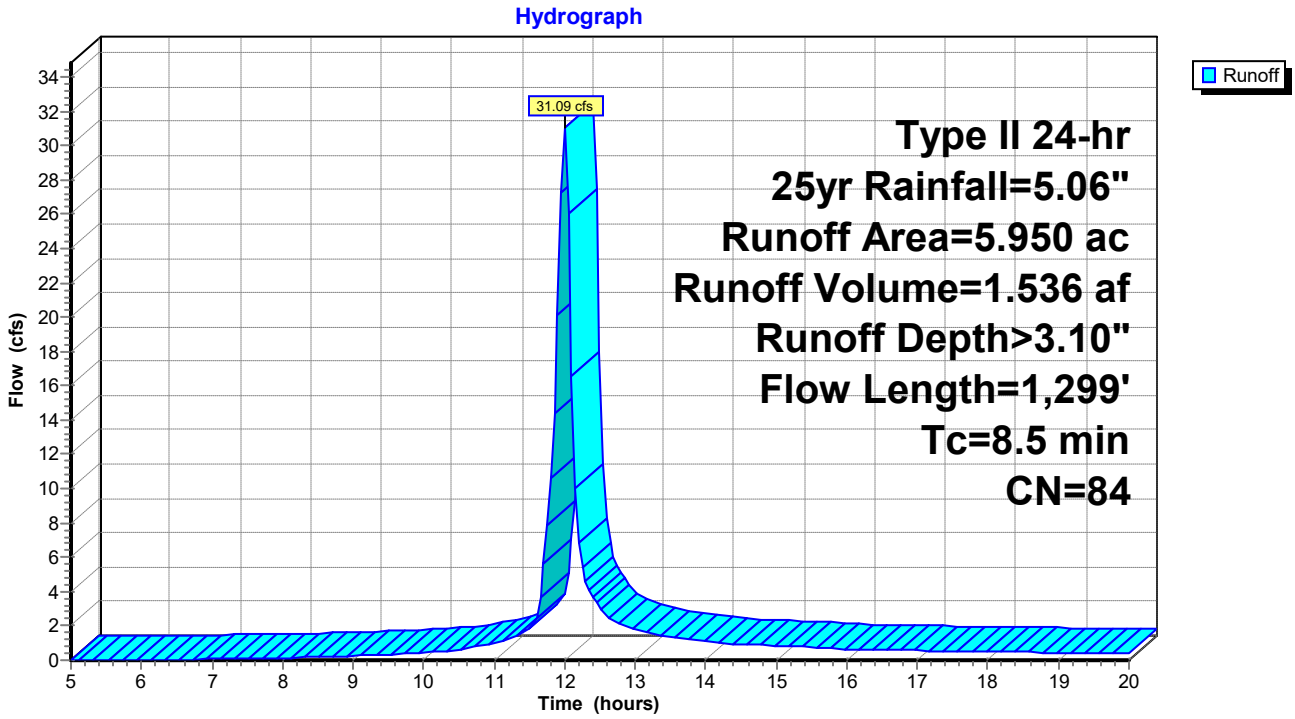
Runoff = 31.09 cfs @ 12.00 hrs, Volume= 1.536 af, Depth> 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=5.06"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
3.757	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
5.950	84	Weighted Average
5.950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	412	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	330	0.0320	2.28	3.19	**Channel Flow,** Area= 1.4 sf Perim= 5.3' r= 0.26' n= 0.048
2.7	557	0.0200	3.47	10.08	**Channel Flow,** Area= 2.9 sf Perim= 5.6' r= 0.52' n= 0.039
8.5	1,299	Total			

Subcatchment 18S: DA-3



Hydrograph for Subcatchment 18S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.32	0.00	0.00
5.25	0.34	0.00	0.00
5.50	0.36	0.00	0.00
5.75	0.38	0.00	0.00
6.00	0.40	0.00	0.01
6.25	0.43	0.00	0.02
6.50	0.45	0.00	0.03
6.75	0.48	0.00	0.05
7.00	0.50	0.01	0.06
7.25	0.53	0.01	0.08
7.50	0.55	0.01	0.09
7.75	0.58	0.02	0.11
8.00	0.61	0.02	0.13
8.25	0.64	0.03	0.15
8.50	0.67	0.04	0.18
8.75	0.70	0.05	0.22
9.00	0.74	0.06	0.26
9.25	0.78	0.07	0.30
9.50	0.82	0.08	0.32
9.75	0.87	0.10	0.36
10.00	0.92	0.12	0.43
10.25	0.97	0.14	0.52
10.50	1.03	0.17	0.64
10.75	1.10	0.20	0.79
11.00	1.19	0.24	0.99
11.25	1.30	0.30	1.33
11.50	1.43	0.37	1.84
11.75	1.96	0.71	7.89
12.00	3.35	1.81	**31.06**
12.25	3.57	2.00	5.37
12.50	3.72	2.13	3.07
12.75	3.82	2.21	2.15
13.00	3.91	2.29	1.80
13.25	3.98	2.35	1.54
13.50	4.04	2.41	1.36
13.75	4.10	2.46	1.20
14.00	4.15	2.50	1.07
14.25	4.19	2.54	0.98
14.50	4.24	2.58	0.93
14.75	4.28	2.62	0.88
15.00	4.32	2.65	0.84
15.25	4.36	2.69	0.79
15.50	4.39	2.72	0.75
15.75	4.42	2.75	0.70
16.00	4.45	2.77	0.65
16.25	4.48	2.80	0.62
16.50	4.51	2.83	0.60
16.75	4.54	2.85	0.59
17.00	4.56	2.87	0.57
17.25	4.59	2.90	0.55
17.50	4.61	2.92	0.54
17.75	4.64	2.94	0.52
18.00	4.66	2.96	0.50
18.25	4.68	2.98	0.49
18.50	4.70	3.00	0.47
18.75	4.73	3.02	0.45
19.00	4.75	3.04	0.44
19.25	4.76	3.06	0.42
19.50	4.78	3.07	0.40
19.75	4.80	3.09	0.39
20.00	**4.82**	**3.10**	0.37

Summary for Subcatchment 19S: DA-1

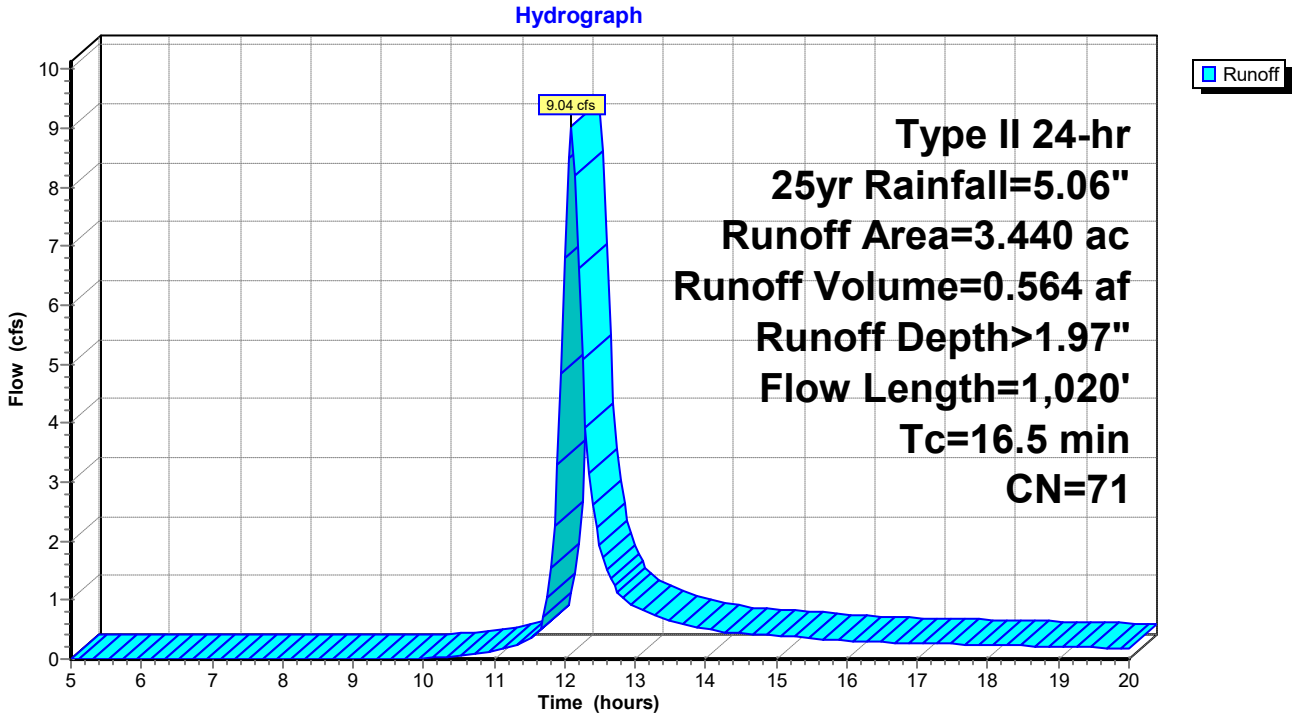
Runoff = 9.04 cfs @ 12.09 hrs, Volume= 0.564 af, Depth> 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=5.06"

Area (ac)	CN	Description
3.440	71	Meadow, non-grazed, HSG C
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
9.8	920	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.5	1,020	Total			

Subcatchment 19S: DA-1



Hydrograph for Subcatchment 19S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.32	0.00	0.00
5.25	0.34	0.00	0.00
5.50	0.36	0.00	0.00
5.75	0.38	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.43	0.00	0.00
6.50	0.45	0.00	0.00
6.75	0.48	0.00	0.00
7.00	0.50	0.00	0.00
7.25	0.53	0.00	0.00
7.50	0.55	0.00	0.00
7.75	0.58	0.00	0.00
8.00	0.61	0.00	0.00
8.25	0.64	0.00	0.00
8.50	0.67	0.00	0.00
8.75	0.70	0.00	0.00
9.00	0.74	0.00	0.00
9.25	0.78	0.00	0.00
9.50	0.82	0.00	0.00
9.75	0.87	0.00	0.00
10.00	0.92	0.00	0.02
10.25	0.97	0.01	0.03
10.50	1.03	0.01	0.06
10.75	1.10	0.02	0.09
11.00	1.19	0.03	0.14
11.25	1.30	0.05	0.21
11.50	1.43	0.08	0.34
11.75	1.96	0.25	1.04
12.00	3.35	0.97	**6.80**
12.25	3.57	1.11	**5.08**
12.50	3.72	1.21	1.94
12.75	3.82	1.27	1.13
13.00	3.91	1.33	0.88
13.25	3.98	1.38	0.74
13.50	4.04	1.42	0.65
13.75	4.10	1.46	0.57
14.00	4.15	1.50	0.51
14.25	4.19	1.53	0.46
14.50	4.24	1.56	0.43
14.75	4.28	1.59	0.41
15.00	4.32	1.62	0.39
15.25	4.36	1.64	0.37
15.50	4.39	1.67	0.35
15.75	4.42	1.69	0.33
16.00	4.45	1.71	0.31
16.25	4.48	1.73	0.29
16.50	4.51	1.75	0.28
16.75	4.54	1.77	0.28
17.00	4.56	1.79	0.27
17.25	4.59	1.81	0.26
17.50	4.61	1.83	0.25
17.75	4.64	1.85	0.25
18.00	4.66	1.86	0.24
18.25	4.68	1.88	0.23
18.50	4.70	1.90	0.22
18.75	4.73	1.91	0.22
19.00	4.75	1.93	0.21
19.25	4.76	1.94	0.20
19.50	4.78	1.95	0.19
19.75	4.80	1.97	0.19
20.00	**4.82**	**1.98**	0.18

Summary for Subcatchment 20S: DA-4

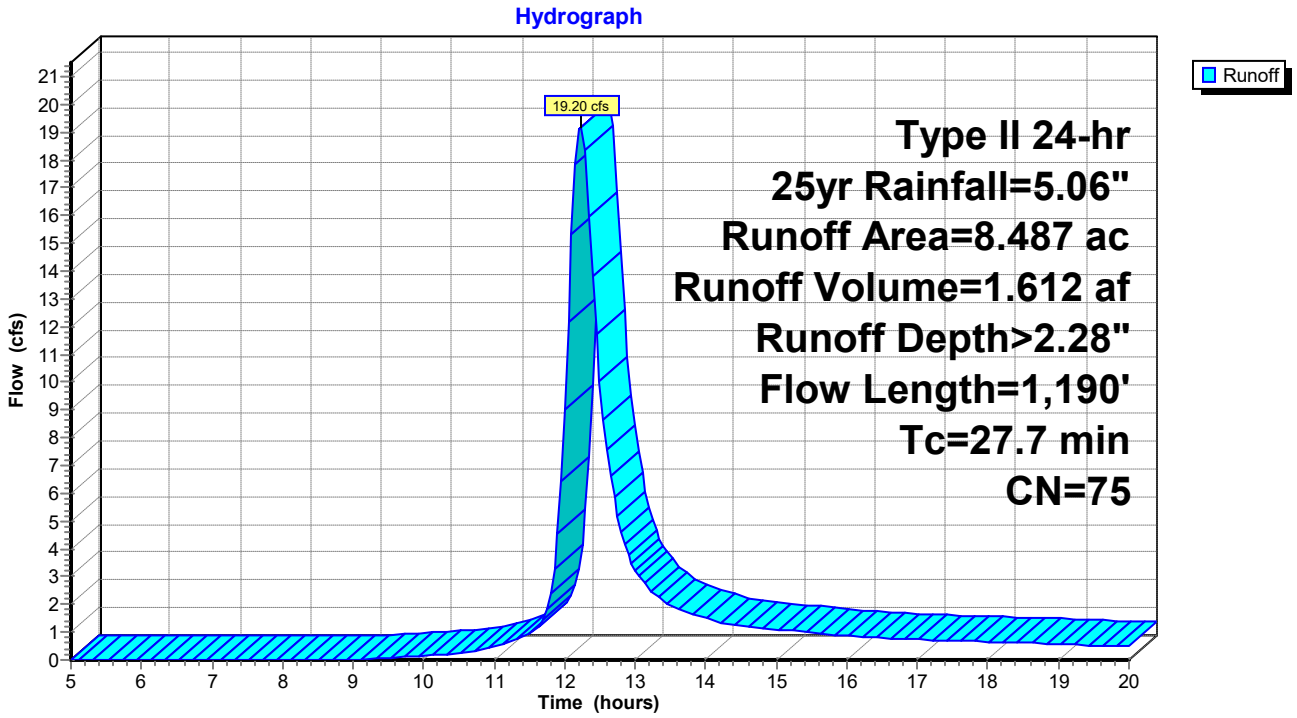
Runoff = 19.20 cfs @ 12.22 hrs, Volume= 1.612 af, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=5.06"

Area (ac)	CN	Description
3.538	71	Meadow, non-grazed, HSG C
4.312	78	Meadow, non-grazed, HSG D
0.427	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.487	75	Weighted Average
8.487		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
4.4	370	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	526	0.0250	1.56	1.87	**Channel Flow,** Area= 1.2 sf Perim= 4.9' r= 0.24' n= 0.059
2.0	194	0.0510	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.7	1,190	Total			

Subcatchment 20S: DA-4



Hydrograph for Subcatchment 20S: DA-4

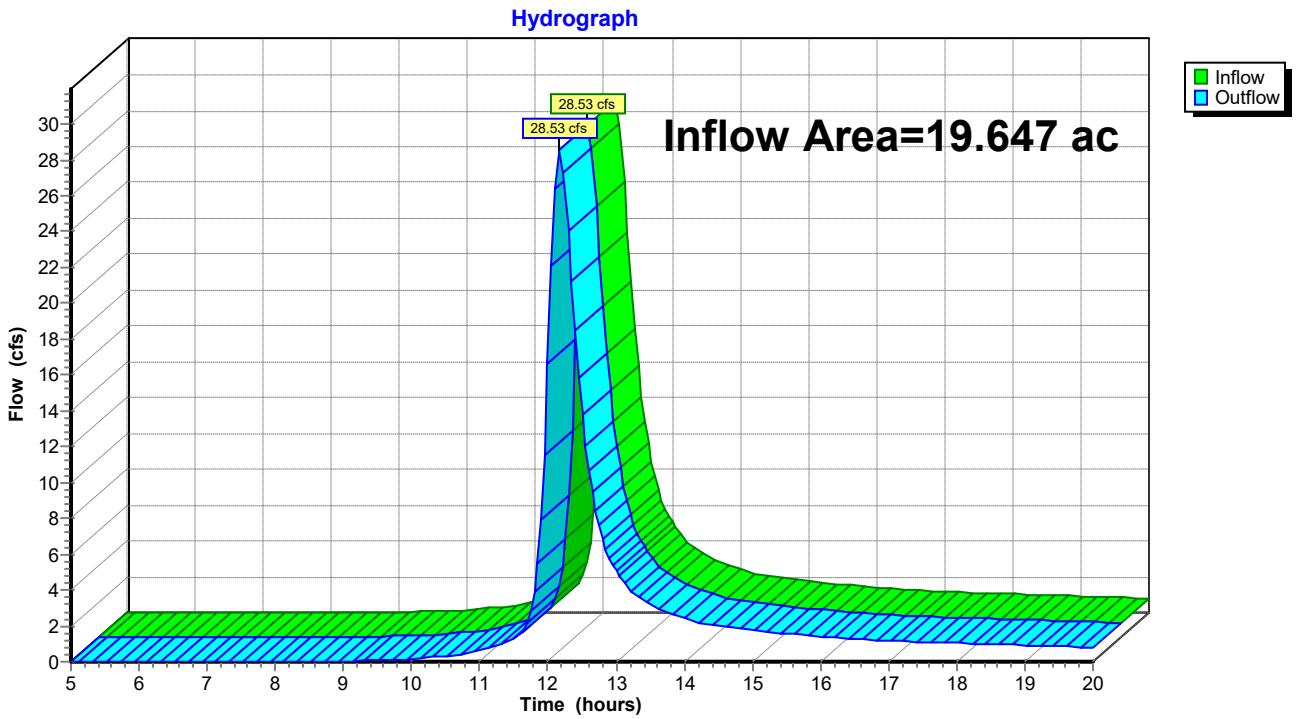
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.32	0.00	0.00
5.25	0.34	0.00	0.00
5.50	0.36	0.00	0.00
5.75	0.38	0.00	0.00
6.00	0.40	0.00	0.00
6.25	0.43	0.00	0.00
6.50	0.45	0.00	0.00
6.75	0.48	0.00	0.00
7.00	0.50	0.00	0.00
7.25	0.53	0.00	0.00
7.50	0.55	0.00	0.00
7.75	0.58	0.00	0.00
8.00	0.61	0.00	0.00
8.25	0.64	0.00	0.00
8.50	0.67	0.00	0.00
8.75	0.70	0.00	0.00
9.00	0.74	0.00	0.01
9.25	0.78	0.00	0.04
9.50	0.82	0.01	0.07
9.75	0.87	0.01	0.10
10.00	0.92	0.02	0.14
10.25	0.97	0.03	0.19
10.50	1.03	0.04	0.26
10.75	1.10	0.05	0.35
11.00	1.19	0.07	0.48
11.25	1.30	0.10	0.66
11.50	1.43	0.14	0.96
11.75	1.96	0.36	1.81
12.00	3.35	1.20	**9.04**
12.25	3.57	1.35	**18.96**
12.50	3.72	1.46	10.00
12.75	3.82	1.53	5.18
13.00	3.91	1.60	3.23
13.25	3.98	1.65	2.41
13.50	4.04	1.70	1.96
13.75	4.10	1.74	1.70
14.00	4.15	1.78	1.50
14.25	4.19	1.81	1.34
14.50	4.24	1.85	1.23
14.75	4.28	1.88	1.16
15.00	4.32	1.91	1.10
15.25	4.36	1.94	1.04
15.50	4.39	1.96	0.99
15.75	4.42	1.99	0.93
16.00	4.45	2.01	0.87
16.25	4.48	2.04	0.82
16.50	4.51	2.06	0.78
16.75	4.54	2.08	0.75
17.00	4.56	2.10	0.73
17.25	4.59	2.12	0.71
17.50	4.61	2.14	0.69
17.75	4.64	2.16	0.67
18.00	4.66	2.18	0.65
18.25	4.68	2.19	0.63
18.50	4.70	2.21	0.61
18.75	4.73	2.23	0.59
19.00	4.75	2.24	0.57
19.25	4.76	2.26	0.55
19.50	4.78	2.27	0.53
19.75	4.80	2.29	0.51
20.00	**4.82**	**2.30**	0.49

Summary for Reach 6R: Reach

Inflow Area = 19.647 ac, 0.00% Impervious, Inflow Depth > 1.51" for 25yr event
Inflow = 28.53 cfs @ 12.17 hrs, Volume= 2.467 af
Outflow = 28.53 cfs @ 12.17 hrs, Volume= 2.467 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Reach



Hydrograph for Reach 6R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.00		0.00
8.50	0.00		0.00
8.75	0.00		0.00
9.00	0.01		0.01
9.25	0.04		0.04
9.50	0.07		0.07
9.75	0.11		0.11
10.00	0.16		0.16
10.25	0.23		0.23
10.50	0.32		0.32
10.75	0.45		0.45
11.00	0.62		0.62
11.25	0.87		0.87
11.50	1.30		1.30
11.75	2.85		2.85
12.00	**16.63**		**16.63**
12.25	**26.42**		**26.42**
12.50	13.74		13.74
12.75	7.58		7.58
13.00	5.04		5.04
13.25	3.86		3.86
13.50	3.18		3.18
13.75	2.76		2.76
14.00	2.43		2.43
14.25	2.16		2.16
14.50	1.99		1.99
14.75	1.87		1.87
15.00	1.77		1.77
15.25	1.67		1.67
15.50	1.58		1.58
15.75	1.49		1.49
16.00	1.40		1.40
16.25	1.32		1.32
16.50	1.26		1.26
16.75	1.21		1.21
17.00	1.18		1.18
17.25	1.15		1.15
17.50	1.11		1.11
17.75	1.08		1.08
18.00	1.05		1.05
18.25	1.02		1.02
18.50	0.98		0.98
18.75	0.95		0.95
19.00	0.92		0.92
19.25	0.89		0.89
19.50	0.85		0.85
19.75	0.82		0.82
20.00	0.79		0.79

Summary for Pond 11P: Infiltration basin

Inflow Area =	1.770 ac,	0.00% Impervious,	Inflow Depth >	2.46"	for 25yr event
Inflow =	6.91 cfs @	12.03 hrs,	Volume=	0.363 af	
Outflow =	2.44 cfs @	12.21 hrs,	Volume=	0.295 af,	Atten= 65%, Lag= 10.9 min
Discarded =	0.02 cfs @	12.21 hrs,	Volume=	0.011 af	
Primary =	2.42 cfs @	12.21 hrs,	Volume=	0.284 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,276.82' @ 12.21 hrs Surf.Area= 6,936 sf Storage= 6,755 cf

Plug-Flow detention time= 101.4 min calculated for 0.295 af (81% of inflow)
Center-of-Mass det. time= 48.1 min (836.8 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,275.00'	17,576 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

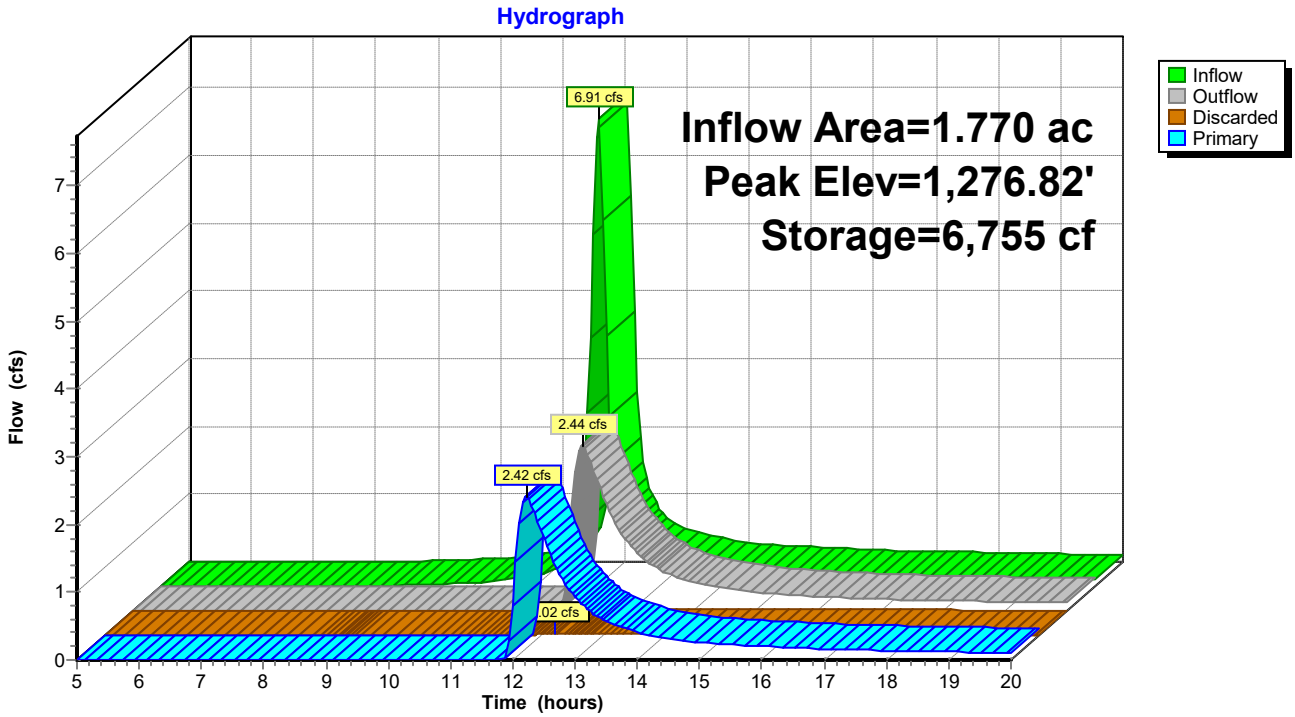
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,275.00	898	0	0
1,276.00	3,791	2,345	2,345
1,278.00	11,440	15,231	17,576

Device	Routing	Invert	Outlet Devices
#1	Primary	1,276.00'	**18.0" Round Pipe** L= 25.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,276.00' / 1,272.00' S= 0.1600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	1,275.00'	**0.125 in/hr Exfiltration over Surface area**
#3	Primary	1,277.00'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

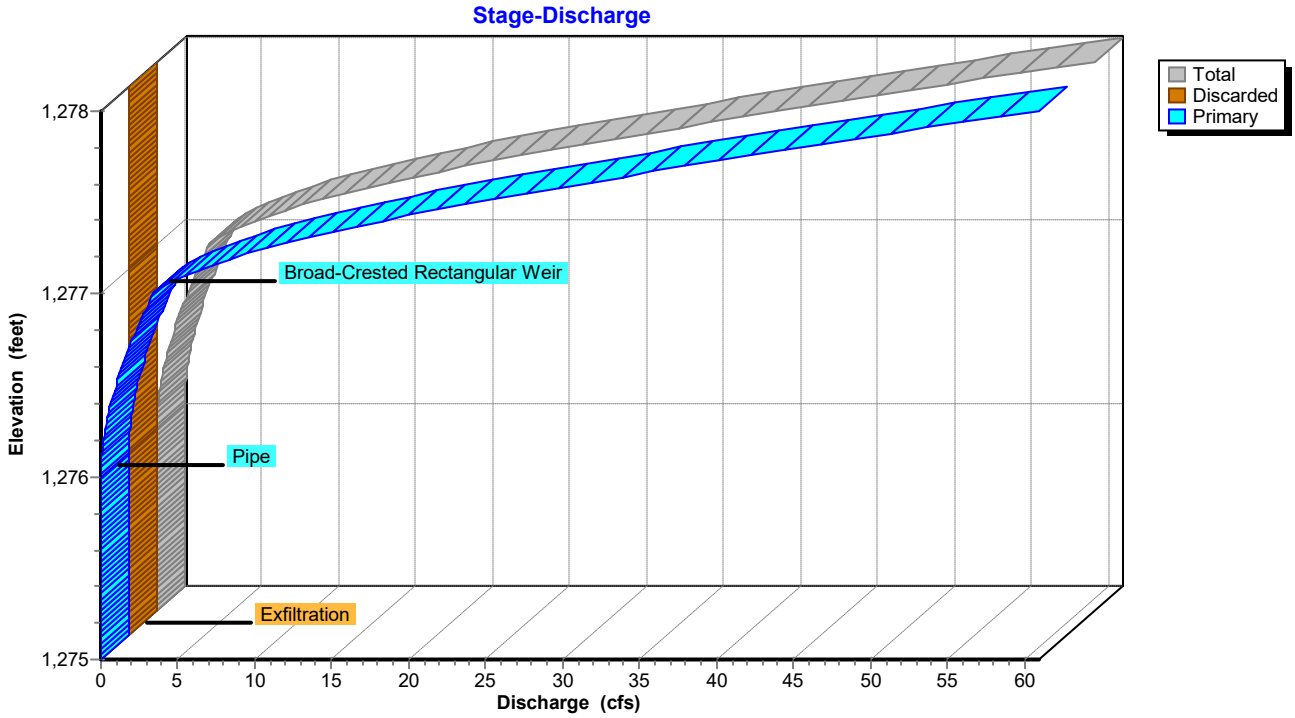
Discarded OutFlow Max=0.02 cfs @ 12.21 hrs HW=1,276.82' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.41 cfs @ 12.21 hrs HW=1,276.82' (Free Discharge)
├─**1=Pipe** (Inlet Controls 2.41 cfs @ 2.43 fps)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: Infiltration basin



Pond 11P: Infiltration basin



Hydrograph for Pond 11P: Infiltration basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.00	0.00	0	1,275.00	0.00	0.00	0.00
5.50	0.00	0	1,275.00	0.00	0.00	0.00
6.00	0.00	0	1,275.00	0.00	0.00	0.00
6.50	0.00	0	1,275.00	0.00	0.00	0.00
7.00	0.00	0	1,275.00	0.00	0.00	0.00
7.50	0.00	0	1,275.00	0.00	0.00	0.00
8.00	0.00	0	1,275.00	0.00	0.00	0.00
8.50	0.01	5	1,275.01	0.00	0.00	0.00
9.00	0.02	27	1,275.03	0.00	0.00	0.00
9.50	0.04	72	1,275.07	0.00	0.00	0.00
10.00	0.06	146	1,275.13	0.00	0.00	0.00
10.50	0.09	271	1,275.22	0.00	0.00	0.00
11.00	0.16	489	1,275.35	0.01	0.01	0.00
11.50	0.34	903	1,275.54	0.01	0.01	0.00
12.00	**6.63**	**4,423**	**1,276.45**	**0.81**	**0.02**	**0.80**
12.50	**0.87**	**5,900**	**1,276.69**	**1.81**	**0.02**	**1.79**
13.00	0.49	4,639	1,276.49	0.95	0.02	0.93
13.50	0.37	4,051	1,276.38	0.59	0.02	0.58
14.00	0.29	3,734	1,276.32	0.42	0.01	0.41
14.50	0.25	3,539	1,276.28	0.33	0.01	0.32
15.00	0.23	3,422	1,276.25	0.28	0.01	0.26
15.50	0.20	3,337	1,276.23	0.24	0.01	0.23
16.00	0.18	3,266	1,276.22	0.21	0.01	0.20
16.50	0.16	3,204	1,276.21	0.19	0.01	0.18
17.00	0.15	3,160	1,276.20	0.18	0.01	0.16
17.50	0.15	3,126	1,276.19	0.16	0.01	0.15
18.00	0.14	3,095	1,276.18	0.15	0.01	0.14
18.50	0.13	3,067	1,276.17	0.14	0.01	0.13
19.00	0.12	3,039	1,276.17	0.13	0.01	0.12
19.50	0.11	3,011	1,276.16	0.13	0.01	0.11
20.00	0.10	2,982	1,276.16	0.12	0.01	0.10

Stage-Discharge for Pond 11P: Infiltration basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
1,275.00	0.00	0.00	0.00
1,275.05	0.00	0.00	0.00
1,275.10	0.00	0.00	0.00
1,275.15	0.00	0.00	0.00
1,275.20	0.00	0.00	0.00
1,275.25	0.00	0.00	0.00
1,275.30	0.01	0.01	0.00
1,275.35	0.01	0.01	0.00
1,275.40	0.01	0.01	0.00
1,275.45	0.01	0.01	0.00
1,275.50	0.01	0.01	0.00
1,275.55	0.01	0.01	0.00
1,275.60	0.01	0.01	0.00
1,275.65	0.01	0.01	0.00
1,275.70	0.01	0.01	0.00
1,275.75	0.01	0.01	0.00
1,275.80	0.01	0.01	0.00
1,275.85	0.01	0.01	0.00
1,275.90	0.01	0.01	0.00
1,275.95	0.01	0.01	0.00
1,276.00	0.01	0.01	0.00
1,276.05	0.02	0.01	0.01
1,276.10	0.06	0.01	0.04
1,276.15	0.11	0.01	0.10
1,276.20	0.18	0.01	0.17
1,276.25	0.27	0.01	0.26
1,276.30	0.38	0.01	0.37
1,276.35	0.51	0.01	0.50
1,276.40	0.66	0.02	0.64
1,276.45	0.82	0.02	0.80
1,276.50	1.00	0.02	0.98
1,276.55	1.19	0.02	1.17
1,276.60	1.39	0.02	1.37
1,276.65	1.61	0.02	1.59
1,276.70	1.84	0.02	1.82
1,276.75	2.08	0.02	2.06
1,276.80	2.32	0.02	2.30
1,276.85	2.58	0.02	2.56
1,276.90	2.84	0.02	2.82
1,276.95	3.11	0.02	3.09
1,277.00	3.39	0.02	3.36
1,277.05	4.19	0.02	4.17
1,277.10	5.44	0.02	5.42
1,277.15	6.98	0.02	6.96
1,277.20	8.74	0.02	8.72
1,277.25	10.80	0.02	10.78
1,277.30	13.10	0.03	13.07
1,277.35	15.61	0.03	15.58
1,277.40	18.34	0.03	18.31
1,277.45	21.25	0.03	21.22
1,277.50	24.34	0.03	24.31
1,277.55	27.68	0.03	27.65
1,277.60	31.23	0.03	31.20
1,277.65	34.57	0.03	34.54
1,277.70	38.03	0.03	38.00
1,277.75	41.59	0.03	41.56
1,277.80	45.27	0.03	45.24
1,277.85	49.04	0.03	49.01
1,277.90	52.91	0.03	52.88
1,277.95	56.88	0.03	56.85
1,278.00	**60.94**	**0.03**	**60.91**

Stage-Area-Storage for Pond 11P: Infiltration basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,275.00	898	0
1,275.05	1,043	49
1,275.10	1,187	104
1,275.15	1,332	167
1,275.20	1,477	237
1,275.25	1,621	315
1,275.30	1,766	400
1,275.35	1,911	491
1,275.40	2,055	591
1,275.45	2,200	697
1,275.50	2,345	811
1,275.55	2,489	931
1,275.60	2,634	1,060
1,275.65	2,778	1,195
1,275.70	2,923	1,337
1,275.75	3,068	1,487
1,275.80	3,212	1,644
1,275.85	3,357	1,808
1,275.90	3,502	1,980
1,275.95	3,646	2,159
1,276.00	3,791	2,345
1,276.05	3,982	2,539
1,276.10	4,173	2,743
1,276.15	4,365	2,956
1,276.20	4,556	3,179
1,276.25	4,747	3,412
1,276.30	4,938	3,654
1,276.35	5,130	3,906
1,276.40	5,321	4,167
1,276.45	5,512	4,438
1,276.50	5,703	4,718
1,276.55	5,894	5,008
1,276.60	6,086	5,308
1,276.65	6,277	5,617
1,276.70	6,468	5,935
1,276.75	6,659	6,263
1,276.80	6,851	6,601
1,276.85	7,042	6,948
1,276.90	7,233	7,305
1,276.95	7,424	7,672
1,277.00	7,616	8,048
1,277.05	7,807	8,433
1,277.10	7,998	8,828
1,277.15	8,189	9,233
1,277.20	8,380	9,647
1,277.25	8,572	10,071
1,277.30	8,763	10,505
1,277.35	8,954	10,947
1,277.40	9,145	11,400
1,277.45	9,337	11,862
1,277.50	9,528	12,334
1,277.55	9,719	12,815
1,277.60	9,910	13,305
1,277.65	10,101	13,806
1,277.70	10,293	14,316
1,277.75	10,484	14,835
1,277.80	10,675	15,364
1,277.85	10,866	15,903
1,277.90	11,058	16,451
1,277.95	11,249	17,008
1,278.00	**11,440**	**17,576**

Summary for Pond 13P: Wet Pond

Inflow Area = 5.950 ac, 0.00% Impervious, Inflow Depth > 3.10" for 25yr event
Inflow = 31.09 cfs @ 12.00 hrs, Volume= 1.536 af
Outflow = 0.02 cfs @ 20.00 hrs, Volume= 0.007 af, Atten= 100%, Lag= 480.2 min
Primary = 0.02 cfs @ 20.00 hrs, Volume= 0.007 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,291.02' @ 20.00 hrs Surf.Area= 30,592 sf Storage= 66,554 cf

Plug-Flow detention time= 617.0 min calculated for 0.007 af (0% of inflow)
Center-of-Mass det. time= 269.9 min (1,041.5 - 771.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,288.50'	214,237 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

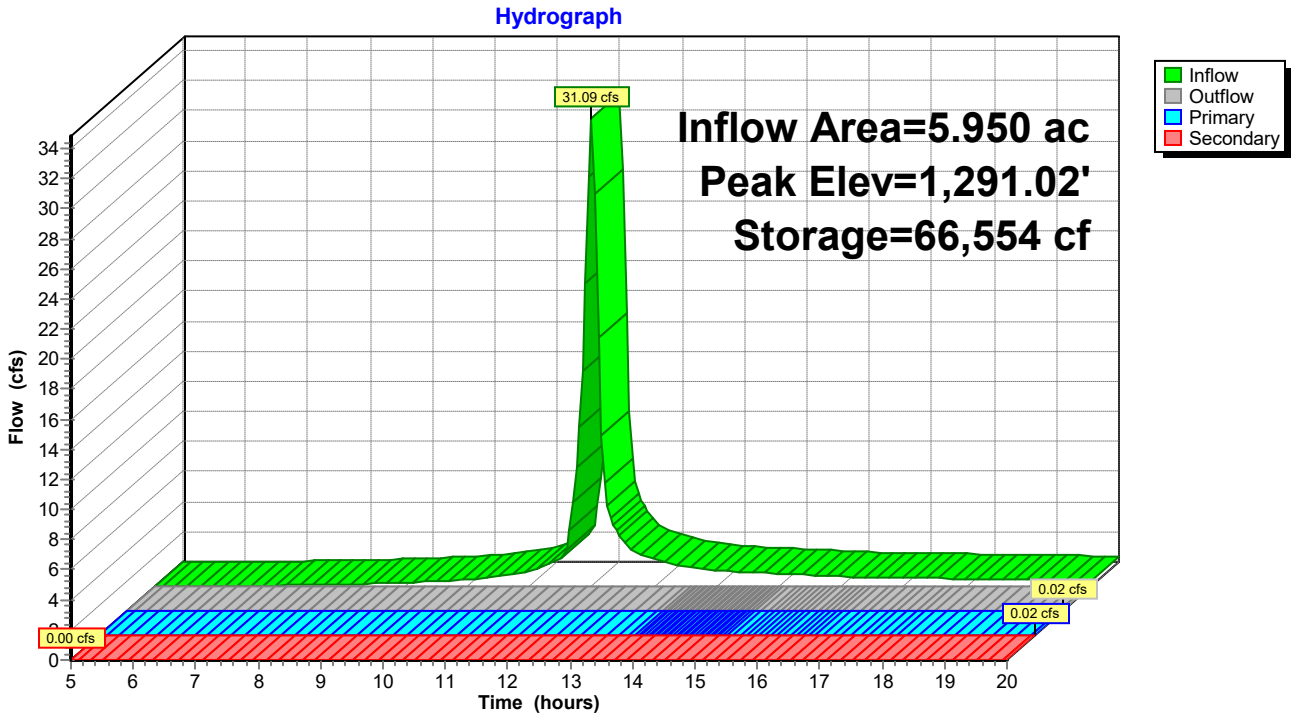
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,288.50	22,471	0	0
1,290.00	27,127	37,199	37,199
1,292.00	33,940	61,067	98,266
1,294.00	40,276	74,216	172,482
1,295.00	43,234	41,755	214,237

Device	Routing	Invert	Outlet Devices
#1	Primary	1,289.50'	**15.0" Round Pipe** L= 100.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,289.50' / 1,289.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,290.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,291.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1,292.00'	**1.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	1,293.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

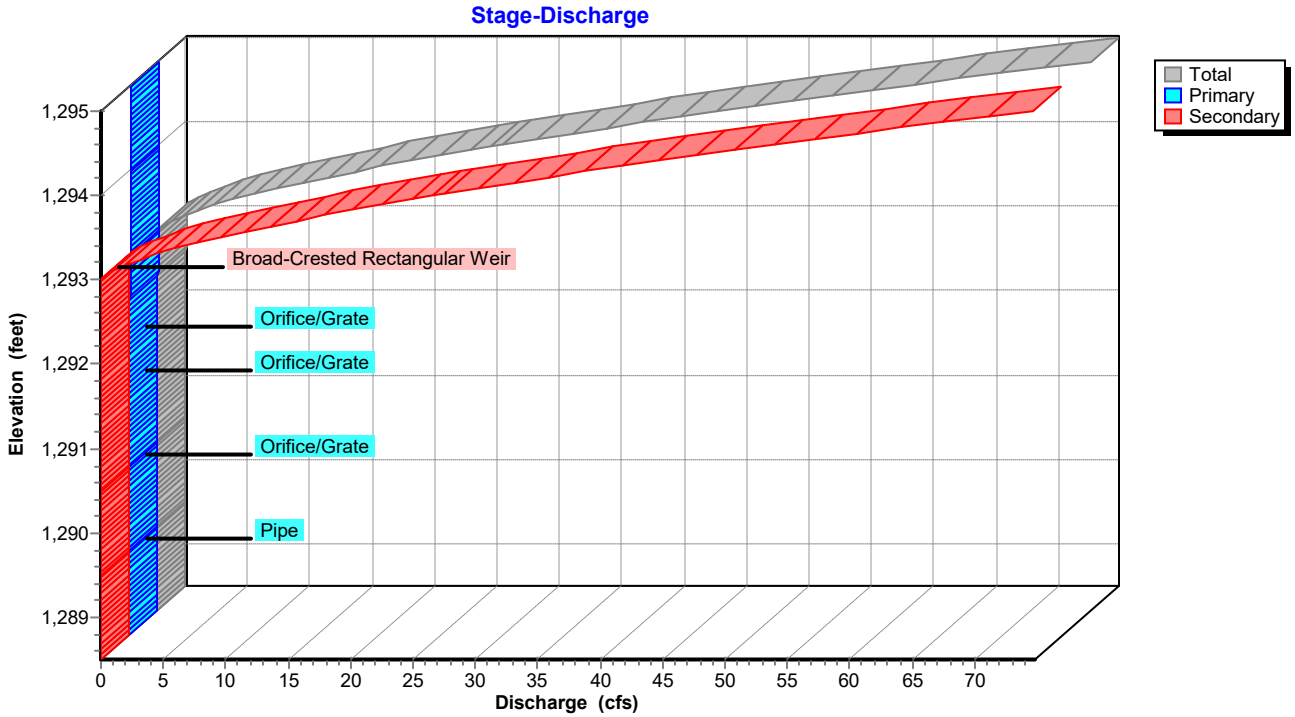
Primary OutFlow Max=0.02 cfs @ 20.00 hrs HW=1,291.02' (Free Discharge)
└─**1=Pipe** (Passes 0.02 cfs of 4.81 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 3.32 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 13P: Wet Pond



Pond 13P: Wet Pond



Hydrograph for Pond 13P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.00	0.00	0	1,288.50	0.00	0.00	**0.00**
5.50	0.00	0	1,288.50	0.00	0.00	0.00
6.00	0.01	2	1,288.50	0.00	0.00	0.00
6.50	0.03	38	1,288.50	0.00	0.00	0.00
7.00	0.06	123	1,288.51	0.00	0.00	0.00
7.50	0.09	262	1,288.51	0.00	0.00	0.00
8.00	0.13	458	1,288.52	0.00	0.00	0.00
8.50	0.18	729	1,288.53	0.00	0.00	0.00
9.00	0.26	1,126	1,288.55	0.00	0.00	0.00
9.50	0.32	1,658	1,288.57	0.00	0.00	0.00
10.00	0.43	2,321	1,288.60	0.00	0.00	0.00
10.50	0.64	3,272	1,288.64	0.00	0.00	0.00
11.00	0.99	4,710	1,288.71	0.00	0.00	0.00
11.50	1.84	7,153	1,288.81	0.00	0.00	0.00
12.00	**31.06**	27,033	1,289.62	0.00	0.00	0.00
12.50	3.07	44,589	1,290.27	0.00	0.00	0.00
13.00	1.80	48,612	1,290.41	0.00	0.00	0.00
13.50	1.36	51,406	1,290.51	0.00	0.00	0.00
14.00	1.07	53,565	1,290.58	0.01	0.01	0.00
14.50	0.93	55,321	1,290.64	0.01	0.01	0.00
15.00	0.84	56,896	1,290.70	0.01	0.01	0.00
15.50	0.75	58,302	1,290.74	0.01	0.01	0.00
16.00	0.65	59,537	1,290.78	0.01	0.01	0.00
16.50	0.60	60,633	1,290.82	0.01	0.01	0.00
17.00	0.57	61,663	1,290.86	0.01	0.01	0.00
17.50	0.54	62,632	1,290.89	0.02	0.02	0.00
18.00	0.50	63,540	1,290.92	0.02	0.02	0.00
18.50	0.47	64,387	1,290.95	0.02	0.02	0.00
19.00	0.44	65,171	1,290.97	0.02	0.02	0.00
19.50	0.40	65,894	1,291.00	0.02	0.02	0.00
20.00	0.37	**66,555**	**1,291.02**	**0.02**	**0.02**	0.00

Stage-Discharge for Pond 13P: Wet Pond

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
1,288.50	0.00	0.00	0.00
1,288.60	0.00	0.00	0.00
1,288.70	0.00	0.00	0.00
1,288.80	0.00	0.00	0.00
1,288.90	0.00	0.00	0.00
1,289.00	0.00	0.00	0.00
1,289.10	0.00	0.00	0.00
1,289.20	0.00	0.00	0.00
1,289.30	0.00	0.00	0.00
1,289.40	0.00	0.00	0.00
1,289.50	0.00	0.00	0.00
1,289.60	0.00	0.00	0.00
1,289.70	0.00	0.00	0.00
1,289.80	0.00	0.00	0.00
1,289.90	0.00	0.00	0.00
1,290.00	0.00	0.00	0.00
1,290.10	0.00	0.00	0.00
1,290.20	0.00	0.00	0.00
1,290.30	0.00	0.00	0.00
1,290.40	0.00	0.00	0.00
1,290.50	0.00	0.00	0.00
1,290.60	0.01	0.01	0.00
1,290.70	0.01	0.01	0.00
1,290.80	0.01	0.01	0.00
1,290.90	0.02	0.02	0.00
1,291.00	0.02	0.02	0.00
1,291.10	0.02	0.02	0.00
1,291.20	0.02	0.02	0.00
1,291.30	0.02	0.02	0.00
1,291.40	0.02	0.02	0.00
1,291.50	0.03	0.03	0.00
1,291.60	0.03	0.03	0.00
1,291.70	0.04	0.04	0.00
1,291.80	0.04	0.04	0.00
1,291.90	0.05	0.05	0.00
1,292.00	0.05	0.05	0.00
1,292.10	0.06	0.06	0.00
1,292.20	0.07	0.07	0.00
1,292.30	0.07	0.07	0.00
1,292.40	0.08	0.08	0.00
1,292.50	0.08	0.08	0.00
1,292.60	0.08	0.08	0.00
1,292.70	0.09	0.09	0.00
1,292.80	0.09	0.09	0.00
1,292.90	0.10	0.10	0.00
1,293.00	0.10	0.10	0.00
1,293.10	0.91	0.10	0.81
1,293.20	2.40	0.10	2.30
1,293.30	4.37	0.11	4.26
1,293.40	6.74	0.11	6.63
1,293.50	9.52	0.11	9.40
1,293.60	12.66	0.12	12.55
1,293.70	15.84	0.12	15.73
1,293.80	19.23	0.12	19.10
1,293.90	22.88	0.12	22.75
1,294.00	26.73	0.13	26.60
1,294.10	30.88	0.13	30.75
1,294.20	35.23	0.13	35.10
1,294.30	39.64	0.13	39.50
1,294.40	44.20	0.14	44.06
1,294.50	48.82	0.14	48.68
1,294.60	53.57	0.14	53.43
1,294.70	58.66	0.14	58.52
1,294.80	63.90	0.15	63.75
1,294.90	69.29	0.15	69.14
1,295.00	**74.82**	**0.15**	**74.67**

Stage-Area-Storage for Pond 13P: Wet Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,288.50	22,471	0
1,288.60	22,781	2,263
1,288.70	23,092	4,556
1,288.80	23,402	6,881
1,288.90	23,713	9,237
1,289.00	24,023	11,624
1,289.10	24,333	14,041
1,289.20	24,644	16,490
1,289.30	24,954	18,970
1,289.40	25,265	21,481
1,289.50	25,575	24,023
1,289.60	25,885	26,596
1,289.70	26,196	29,200
1,289.80	26,506	31,835
1,289.90	26,817	34,501
1,290.00	27,127	37,199
1,290.10	27,468	39,928
1,290.20	27,808	42,692
1,290.30	28,149	45,490
1,290.40	28,490	48,322
1,290.50	28,830	51,188
1,290.60	29,171	54,088
1,290.70	29,512	57,022
1,290.80	29,852	59,990
1,290.90	30,193	62,992
1,291.00	30,534	66,029
1,291.10	30,874	69,099
1,291.20	31,215	72,204
1,291.30	31,555	75,342
1,291.40	31,896	78,515
1,291.50	32,237	81,721
1,291.60	32,577	84,962
1,291.70	32,918	88,237
1,291.80	33,259	91,546
1,291.90	33,599	94,889
1,292.00	33,940	98,266
1,292.10	34,257	101,675
1,292.20	34,574	105,117
1,292.30	34,890	108,590
1,292.40	35,207	112,095
1,292.50	35,524	115,632
1,292.60	35,841	119,200
1,292.70	36,158	122,800
1,292.80	36,474	126,431
1,292.90	36,791	130,095
1,293.00	37,108	133,790
1,293.10	37,425	137,516
1,293.20	37,742	141,274
1,293.30	38,058	145,064
1,293.40	38,375	148,886
1,293.50	38,692	152,740
1,293.60	39,009	156,625
1,293.70	39,326	160,541
1,293.80	39,642	164,490
1,293.90	39,959	168,470
1,294.00	40,276	172,482
1,294.10	40,572	176,524
1,294.20	40,868	180,596
1,294.30	41,163	184,697
1,294.40	41,459	188,829
1,294.50	41,755	192,989
1,294.60	42,051	197,180
1,294.70	42,347	201,399
1,294.80	42,642	205,649
1,294.90	42,938	209,928
1,295.00	**43,234**	**214,237**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 14S: DA-2 Runoff Area=1.770 ac 0.00% Impervious Runoff Depth>3.12"
Flow Length=369' Tc=11.1 min CN=77 Runoff=8.68 cfs 0.460 af

Subcatchment 18S: DA-3 Runoff Area=5.950 ac 0.00% Impervious Runoff Depth>3.81"
Flow Length=1,299' Tc=8.5 min CN=84 Runoff=37.81 cfs 1.891 af

Subcatchment 19S: DA-1 Runoff Area=3.440 ac 0.00% Impervious Runoff Depth>2.56"
Flow Length=1,020' Tc=16.5 min CN=71 Runoff=11.80 cfs 0.735 af

Subcatchment 20S: DA-4 Runoff Area=8.487 ac 0.00% Impervious Runoff Depth>2.92"
Flow Length=1,190' Tc=27.7 min CN=75 Runoff=24.57 cfs 2.062 af

Reach 6R: Reach Inflow=37.30 cfs 3.189 af
Outflow=37.30 cfs 3.189 af

Pond 11P: Infiltration basin Peak Elev=1,277.02' Storage=8,208 cf Inflow=8.68 cfs 0.460 af
Discarded=0.02 cfs 0.012 af Primary=3.64 cfs 0.379 af Outflow=3.66 cfs 0.390 af

Pond 13P: Wet Pond Peak Elev=1,291.50' Storage=81,757 cf Inflow=37.81 cfs 1.891 af
Primary=0.03 cfs 0.013 af Secondary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.013 af

Total Runoff Area = 19.647 ac Runoff Volume = 5.148 af Average Runoff Depth = 3.14"
100.00% Pervious = 19.647 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 14S: DA-2

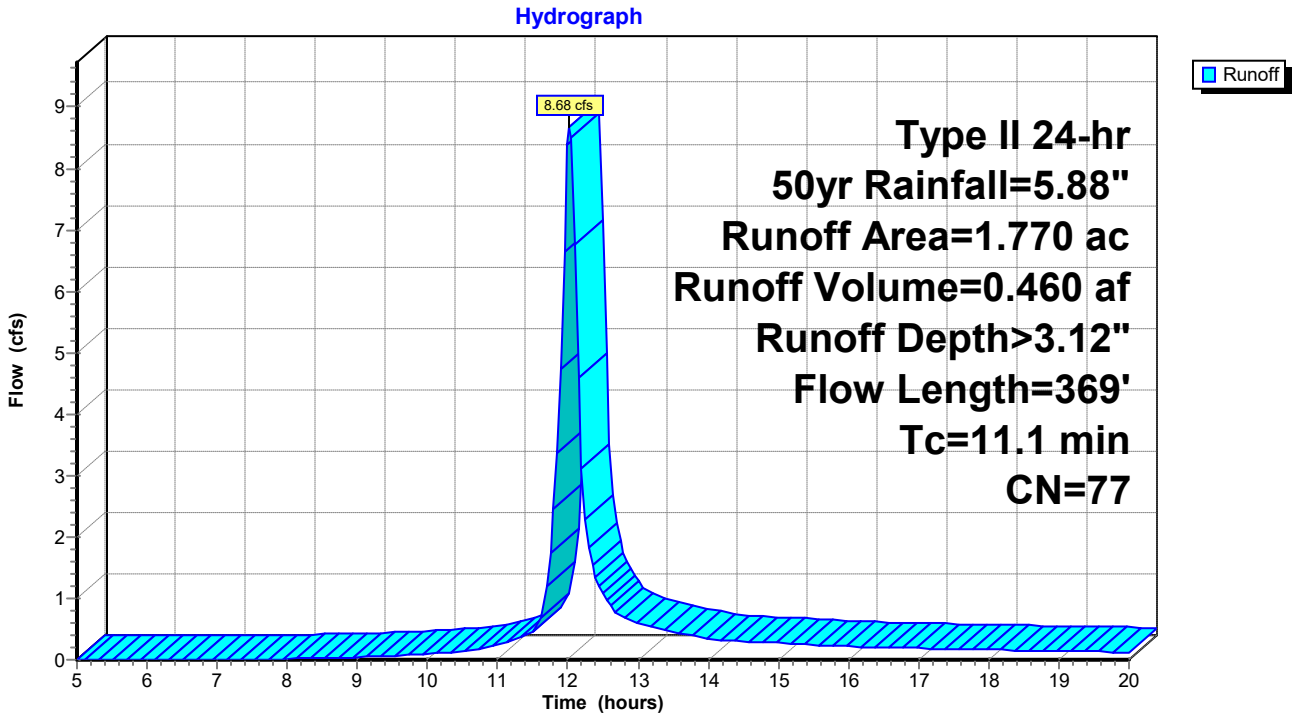
Runoff = 8.68 cfs @ 12.03 hrs, Volume= 0.460 af, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.88"

	Area (ac)	CN	Description
*	0.545	89	Gravel, HSG C
	1.225	71	Meadow, non-grazed, HSG C
	1.770	77	Weighted Average
	1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	175	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	54	0.0750	1.37		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.1	369	Total			

Subcatchment 14S: DA-2



Hydrograph for Subcatchment 14S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.37	0.00	0.00
5.25	0.39	0.00	0.00
5.50	0.42	0.00	0.00
5.75	0.44	0.00	0.00
6.00	0.47	0.00	0.00
6.25	0.50	0.00	0.00
6.50	0.52	0.00	0.00
6.75	0.55	0.00	0.00
7.00	0.58	0.00	0.00
7.25	0.61	0.00	0.00
7.50	0.64	0.00	0.00
7.75	0.67	0.00	0.01
8.00	0.71	0.00	0.01
8.25	0.74	0.01	0.02
8.50	0.78	0.01	0.03
8.75	0.82	0.02	0.03
9.00	0.86	0.02	0.04
9.25	0.91	0.03	0.06
9.50	0.96	0.04	0.06
9.75	1.01	0.05	0.07
10.00	1.06	0.06	0.09
10.25	1.13	0.08	0.11
10.50	1.20	0.10	0.14
10.75	1.28	0.13	0.18
11.00	1.38	0.16	0.24
11.25	1.51	0.21	0.32
11.50	1.66	0.28	0.46
11.75	2.28	0.60	1.75
12.00	3.90	1.73	**8.38**
12.25	4.15	1.93	**2.28**
12.50	4.32	2.07	1.07
12.75	4.44	2.16	0.72
13.00	4.54	2.24	0.59
13.25	4.62	2.31	0.51
13.50	4.70	2.37	0.45
13.75	4.76	2.43	0.39
14.00	4.82	2.47	0.35
14.25	4.87	2.52	0.32
14.50	4.93	2.56	0.30
14.75	4.97	2.60	0.29
15.00	5.02	2.64	0.27
15.25	5.06	2.67	0.26
15.50	5.10	2.71	0.24
15.75	5.14	2.74	0.23
16.00	5.17	2.77	0.21
16.25	5.21	2.80	0.20
16.50	5.24	2.83	0.20
16.75	5.27	2.85	0.19
17.00	5.30	2.88	0.19
17.25	5.33	2.90	0.18
17.50	5.36	2.93	0.18
17.75	5.39	2.95	0.17
18.00	5.42	2.97	0.16
18.25	5.44	3.00	0.16
18.50	5.47	3.02	0.15
18.75	5.49	3.04	0.15
19.00	5.51	3.06	0.14
19.25	5.54	3.08	0.14
19.50	5.56	3.10	0.13
19.75	5.58	3.11	0.13
20.00	**5.60**	**3.13**	0.12

Summary for Subcatchment 18S: DA-3

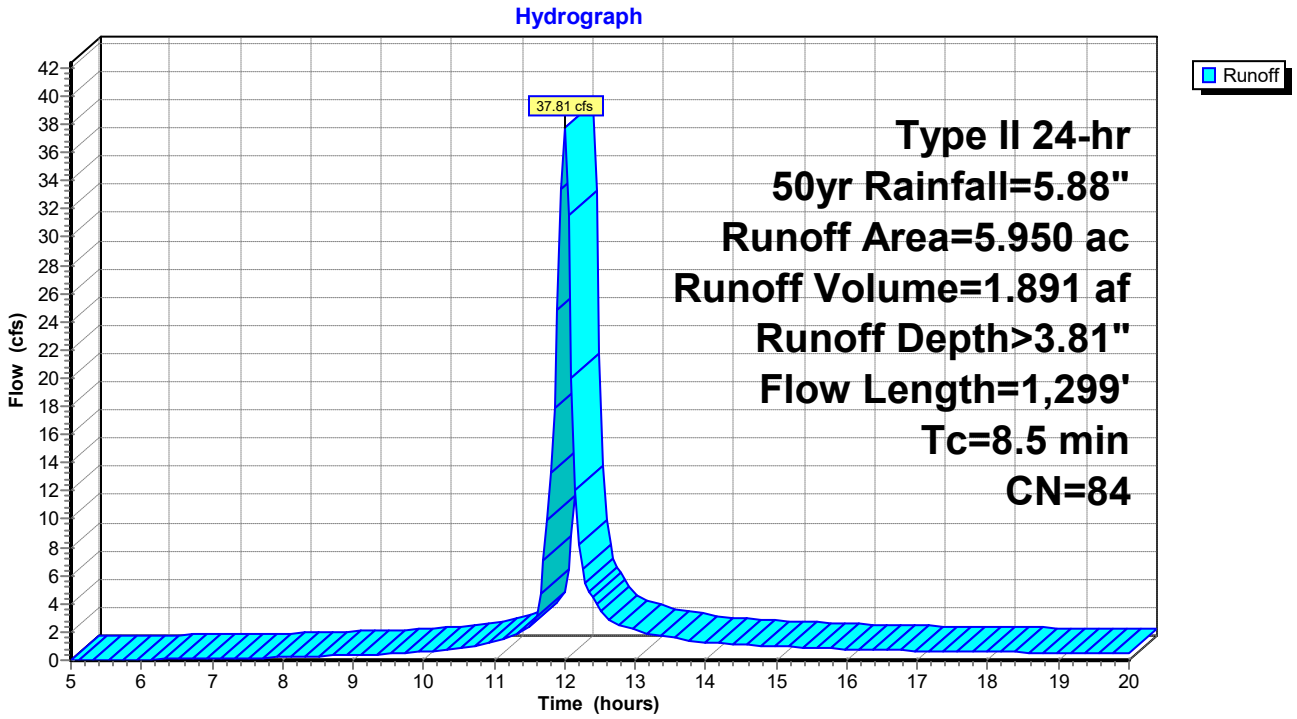
Runoff = 37.81 cfs @ 12.00 hrs, Volume= 1.891 af, Depth> 3.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.88"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
3.757	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
5.950	84	Weighted Average
5.950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	412	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	330	0.0320	2.28	3.19	**Channel Flow,** Area= 1.4 sf Perim= 5.3' r= 0.26' n= 0.048
2.7	557	0.0200	3.47	10.08	**Channel Flow,** Area= 2.9 sf Perim= 5.6' r= 0.52' n= 0.039
8.5	1,299	Total			

Subcatchment 18S: DA-3



Hydrograph for Subcatchment 18S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.37	0.00	0.00
5.25	0.39	0.00	0.00
5.50	0.42	0.00	0.02
5.75	0.44	0.00	0.03
6.00	0.47	0.00	0.05
6.25	0.50	0.01	0.06
6.50	0.52	0.01	0.08
6.75	0.55	0.01	0.10
7.00	0.58	0.02	0.12
7.25	0.61	0.02	0.14
7.50	0.64	0.03	0.16
7.75	0.67	0.04	0.18
8.00	0.71	0.05	0.20
8.25	0.74	0.06	0.23
8.50	0.78	0.07	0.27
8.75	0.82	0.08	0.32
9.00	0.86	0.10	0.38
9.25	0.91	0.12	0.42
9.50	0.96	0.13	0.45
9.75	1.01	0.16	0.51
10.00	1.06	0.18	0.60
10.25	1.13	0.21	0.71
10.50	1.20	0.25	0.86
10.75	1.28	0.29	1.05
11.00	1.38	0.34	1.31
11.25	1.51	0.42	1.73
11.50	1.66	0.52	2.36
11.75	2.28	0.94	9.95
12.00	3.90	2.28	**37.77**
12.25	4.15	2.51	6.46
12.50	4.32	2.66	3.67
12.75	4.44	2.76	2.57
13.00	4.54	2.85	2.15
13.25	4.62	2.93	1.84
13.50	4.70	3.00	1.62
13.75	4.76	3.05	1.43
14.00	4.82	3.11	1.27
14.25	4.87	3.16	1.16
14.50	4.93	3.20	1.11
14.75	4.97	3.25	1.05
15.00	5.02	3.29	1.00
15.25	5.06	3.33	0.94
15.50	5.10	3.36	0.89
15.75	5.14	3.40	0.83
16.00	5.17	3.43	0.78
16.25	5.21	3.46	0.74
16.50	5.24	3.49	0.72
16.75	5.27	3.52	0.70
17.00	5.30	3.55	0.68
17.25	5.33	3.58	0.66
17.50	5.36	3.60	0.64
17.75	5.39	3.63	0.62
18.00	5.42	3.65	0.60
18.25	5.44	3.68	0.58
18.50	5.47	3.70	0.56
18.75	5.49	3.72	0.54
19.00	5.51	3.74	0.52
19.25	5.54	3.76	0.50
19.50	5.56	3.78	0.48
19.75	5.58	3.80	0.46
20.00	**5.60**	**3.82**	0.44

Summary for Subcatchment 19S: DA-1

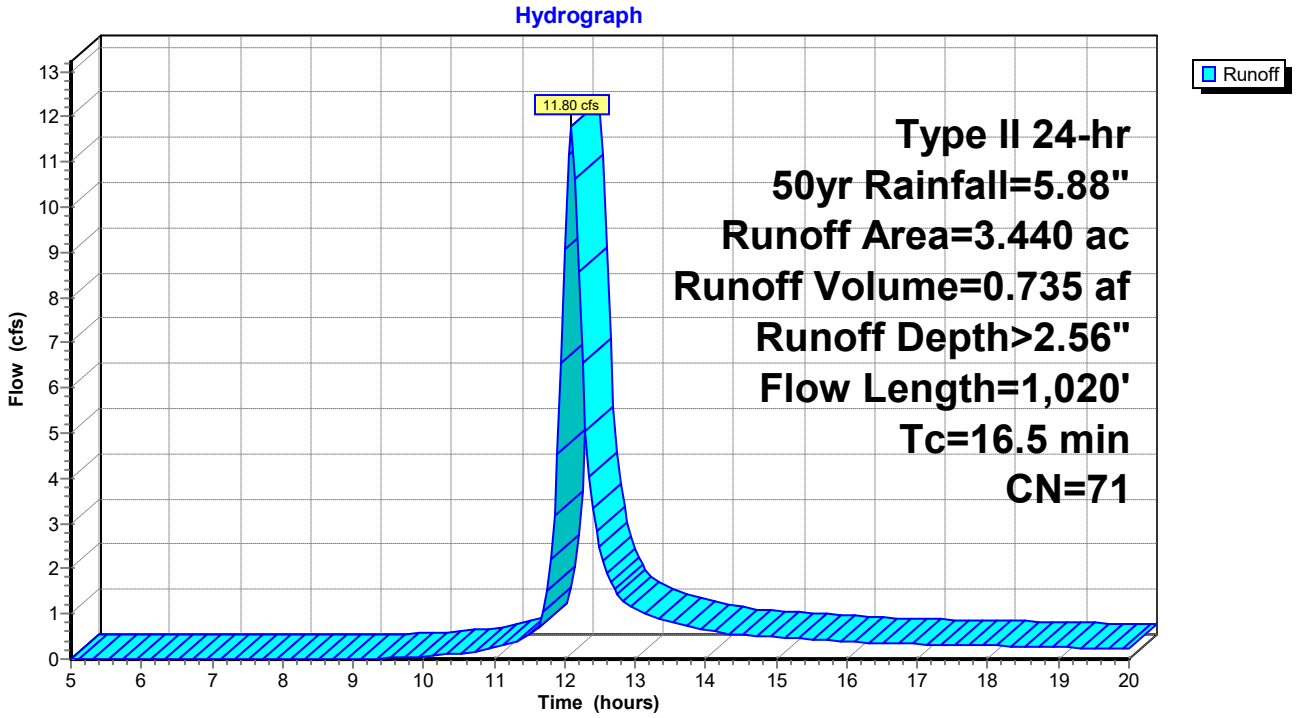
Runoff = 11.80 cfs @ 12.09 hrs, Volume= 0.735 af, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.88"

Area (ac)	CN	Description
3.440	71	Meadow, non-grazed, HSG C
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
9.8	920	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.5	1,020	Total			

Subcatchment 19S: DA-1



Hydrograph for Subcatchment 19S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.37	0.00	0.00
5.25	0.39	0.00	0.00
5.50	0.42	0.00	0.00
5.75	0.44	0.00	0.00
6.00	0.47	0.00	0.00
6.25	0.50	0.00	0.00
6.50	0.52	0.00	0.00
6.75	0.55	0.00	0.00
7.00	0.58	0.00	0.00
7.25	0.61	0.00	0.00
7.50	0.64	0.00	0.00
7.75	0.67	0.00	0.00
8.00	0.71	0.00	0.00
8.25	0.74	0.00	0.00
8.50	0.78	0.00	0.00
8.75	0.82	0.00	0.00
9.00	0.86	0.00	0.00
9.25	0.91	0.00	0.01
9.50	0.96	0.00	0.03
9.75	1.01	0.01	0.04
10.00	1.06	0.01	0.06
10.25	1.13	0.02	0.09
10.50	1.20	0.03	0.13
10.75	1.28	0.05	0.18
11.00	1.38	0.07	0.25
11.25	1.51	0.10	0.35
11.50	1.66	0.15	0.53
11.75	2.28	0.38	1.52
12.00	3.90	1.33	**9.05**
12.25	4.15	1.50	**6.53**
12.50	4.32	1.62	2.46
12.75	4.44	1.70	1.42
13.00	4.54	1.77	1.10
13.25	4.62	1.84	0.92
13.50	4.70	1.89	0.81
13.75	4.76	1.94	0.71
14.00	4.82	1.98	0.64
14.25	4.87	2.02	0.57
14.50	4.93	2.06	0.54
14.75	4.97	2.10	0.51
15.00	5.02	2.13	0.49
15.25	5.06	2.16	0.46
15.50	5.10	2.19	0.44
15.75	5.14	2.22	0.41
16.00	5.17	2.25	0.39
16.25	5.21	2.27	0.36
16.50	5.24	2.30	0.35
16.75	5.27	2.32	0.34
17.00	5.30	2.35	0.33
17.25	5.33	2.37	0.32
17.50	5.36	2.39	0.31
17.75	5.39	2.41	0.30
18.00	5.42	2.44	0.30
18.25	5.44	2.46	0.29
18.50	5.47	2.48	0.28
18.75	5.49	2.49	0.27
19.00	5.51	2.51	0.26
19.25	5.54	2.53	0.25
19.50	5.56	2.55	0.24
19.75	5.58	2.56	0.23
20.00	**5.60**	**2.58**	0.22

Summary for Subcatchment 20S: DA-4

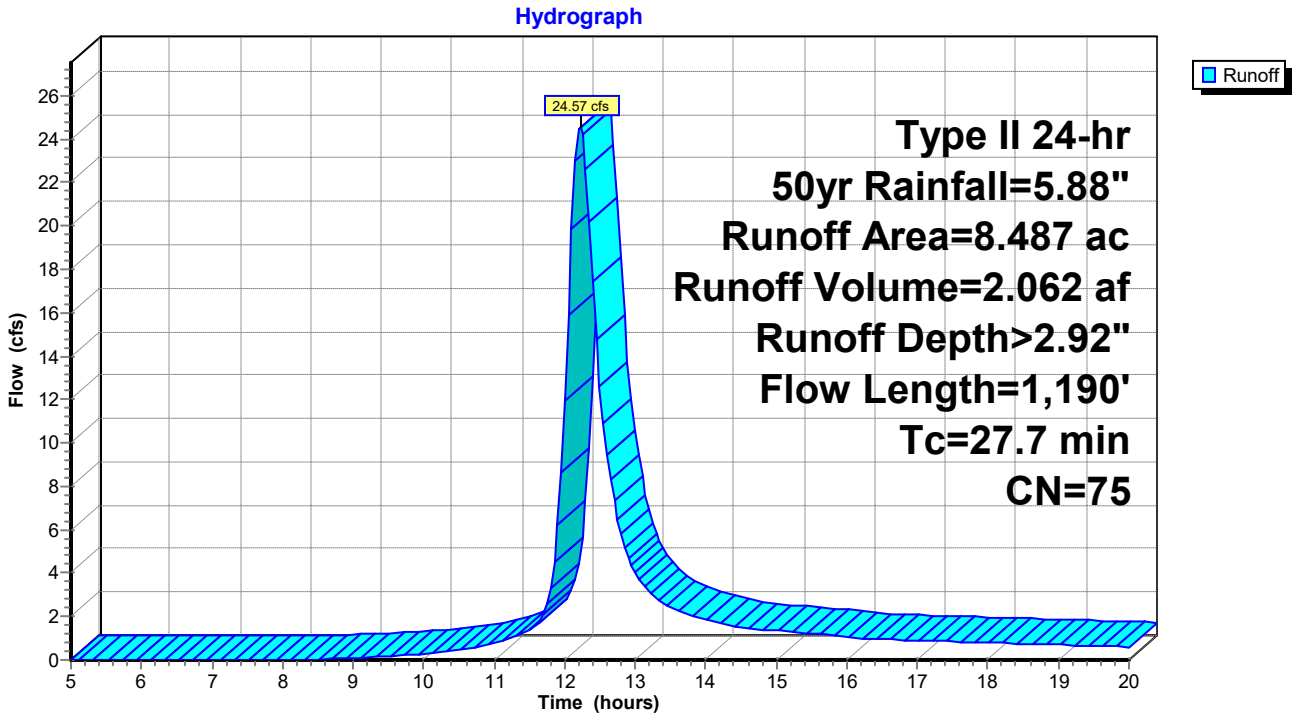
Runoff = 24.57 cfs @ 12.22 hrs, Volume= 2.062 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.88"

Area (ac)	CN	Description
3.538	71	Meadow, non-grazed, HSG C
4.312	78	Meadow, non-grazed, HSG D
0.427	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.487	75	Weighted Average
8.487		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
4.4	370	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	526	0.0250	1.56	1.87	**Channel Flow,** Area= 1.2 sf Perim= 4.9' r= 0.24' n= 0.059
2.0	194	0.0510	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.7	1,190	Total			

Subcatchment 20S: DA-4



Hydrograph for Subcatchment 20S: DA-4

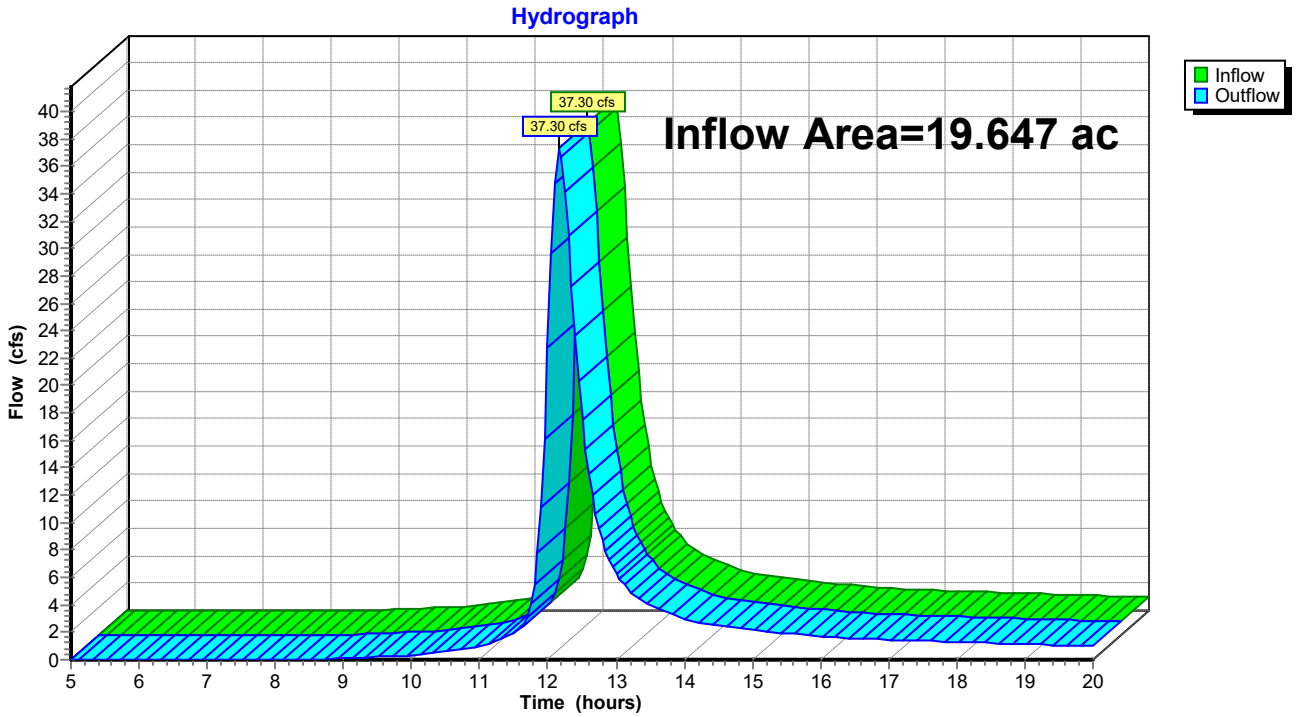
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.37	0.00	0.00
5.25	0.39	0.00	0.00
5.50	0.42	0.00	0.00
5.75	0.44	0.00	0.00
6.00	0.47	0.00	0.00
6.25	0.50	0.00	0.00
6.50	0.52	0.00	0.00
6.75	0.55	0.00	0.00
7.00	0.58	0.00	0.00
7.25	0.61	0.00	0.00
7.50	0.64	0.00	0.00
7.75	0.67	0.00	0.00
8.00	0.71	0.00	0.00
8.25	0.74	0.00	0.01
8.50	0.78	0.00	0.04
8.75	0.82	0.01	0.06
9.00	0.86	0.01	0.10
9.25	0.91	0.02	0.14
9.50	0.96	0.02	0.18
9.75	1.01	0.03	0.22
10.00	1.06	0.04	0.28
10.25	1.13	0.06	0.35
10.50	1.20	0.07	0.45
10.75	1.28	0.10	0.58
11.00	1.38	0.13	0.75
11.25	1.51	0.17	1.00
11.50	1.66	0.23	1.40
11.75	2.28	0.52	2.55
12.00	3.90	1.59	**11.96**
12.25	4.15	1.78	**24.20**
12.50	4.32	1.91	12.60
12.75	4.44	2.00	6.47
13.00	4.54	2.08	4.00
13.25	4.62	2.15	2.97
13.50	4.70	2.21	2.41
13.75	4.76	2.26	2.09
14.00	4.82	2.31	1.84
14.25	4.87	2.35	1.64
14.50	4.93	2.39	1.50
14.75	4.97	2.43	1.42
15.00	5.02	2.46	1.34
15.25	5.06	2.50	1.27
15.50	5.10	2.53	1.21
15.75	5.14	2.56	1.14
16.00	5.17	2.59	1.07
16.25	5.21	2.62	1.00
16.50	5.24	2.65	0.95
16.75	5.27	2.67	0.92
17.00	5.30	2.70	0.89
17.25	5.33	2.72	0.87
17.50	5.36	2.74	0.84
17.75	5.39	2.77	0.82
18.00	5.42	2.79	0.79
18.25	5.44	2.81	0.77
18.50	5.47	2.83	0.74
18.75	5.49	2.85	0.72
19.00	5.51	2.87	0.69
19.25	5.54	2.89	0.67
19.50	5.56	2.91	0.64
19.75	5.58	2.93	0.62
20.00	**5.60**	**2.94**	0.59

Summary for Reach 6R: Reach

Inflow Area = 19.647 ac, 0.00% Impervious, Inflow Depth > 1.95" for 50yr event
Inflow = 37.30 cfs @ 12.17 hrs, Volume= 3.189 af
Outflow = 37.30 cfs @ 12.17 hrs, Volume= 3.189 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Reach



Hydrograph for Reach 6R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.01		0.01
8.50	0.04		0.04
8.75	0.06		0.06
9.00	0.10		0.10
9.25	0.16		0.16
9.50	0.21		0.21
9.75	0.27		0.27
10.00	0.34		0.34
10.25	0.44		0.44
10.50	0.58		0.58
10.75	0.75		0.75
11.00	1.00		1.00
11.25	1.35		1.35
11.50	1.93		1.93
11.75	4.06		4.06
12.00	**22.70**		**22.70**
12.25	**34.10**		**34.10**
12.50	17.51		17.51
12.75	9.56		9.56
13.00	6.30		6.30
13.25	4.80		4.80
13.50	3.94		3.94
13.75	3.40		3.40
14.00	2.99		2.99
14.25	2.66		2.66
14.50	2.44		2.44
14.75	2.29		2.29
15.00	2.17		2.17
15.25	2.05		2.05
15.50	1.94		1.94
15.75	1.83		1.83
16.00	1.72		1.72
16.25	1.61		1.61
16.50	1.54		1.54
16.75	1.49		1.49
17.00	1.45		1.45
17.25	1.40		1.40
17.50	1.36		1.36
17.75	1.32		1.32
18.00	1.28		1.28
18.25	1.24		1.24
18.50	1.20		1.20
18.75	1.16		1.16
19.00	1.12		1.12
19.25	1.08		1.08
19.50	1.04		1.04
19.75	1.00		1.00
20.00	0.96		0.96

Summary for Pond 11P: Infiltration basin

Inflow Area =	1.770 ac,	0.00% Impervious,	Inflow Depth >	3.12"	for 50yr event
Inflow =	8.68 cfs @	12.03 hrs,	Volume=	0.460 af	
Outflow =	3.66 cfs @	12.19 hrs,	Volume=	0.390 af,	Atten= 58%, Lag= 9.5 min
Discarded =	0.02 cfs @	12.18 hrs,	Volume=	0.012 af	
Primary =	3.64 cfs @	12.19 hrs,	Volume=	0.379 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,277.02' @ 12.18 hrs Surf.Area= 7,696 sf Storage= 8,208 cf

Plug-Flow detention time= 89.0 min calculated for 0.389 af (84% of inflow)
Center-of-Mass det. time= 43.6 min (827.1 - 783.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,275.00'	17,576 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

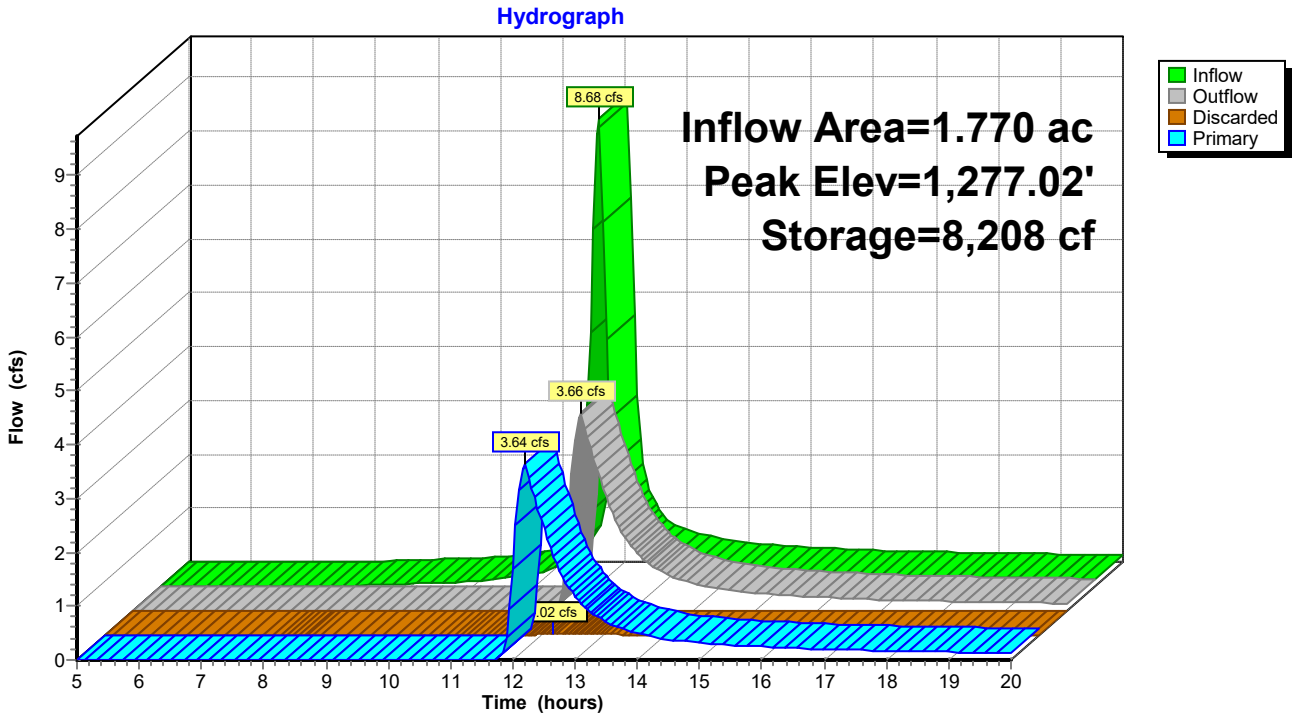
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,275.00	898	0	0
1,276.00	3,791	2,345	2,345
1,278.00	11,440	15,231	17,576

Device	Routing	Invert	Outlet Devices
#1	Primary	1,276.00'	**18.0" Round Pipe** L= 25.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,276.00' / 1,272.00' S= 0.1600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	1,275.00'	**0.125 in/hr Exfiltration over Surface area**
#3	Primary	1,277.00'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

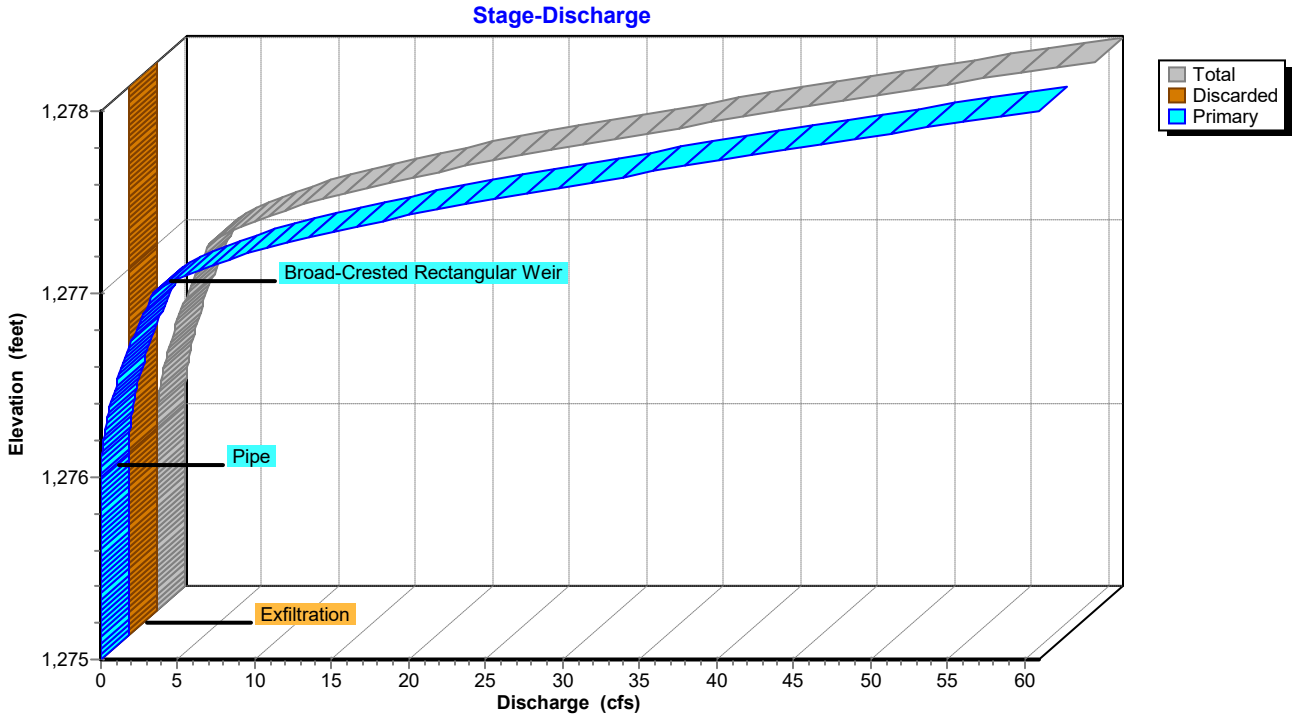
Discarded OutFlow Max=0.02 cfs @ 12.18 hrs HW=1,277.02' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.59 cfs @ 12.19 hrs HW=1,277.02' (Free Discharge)
├─**1=Pipe** (Inlet Controls 3.47 cfs @ 2.71 fps)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.32 fps)

Pond 11P: Infiltration basin



Pond 11P: Infiltration basin



Hydrograph for Pond 11P: Infiltration basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.00	0.00	0	1,275.00	0.00	0.00	0.00
5.50	0.00	0	1,275.00	0.00	0.00	0.00
6.00	0.00	0	1,275.00	0.00	0.00	0.00
6.50	0.00	0	1,275.00	0.00	0.00	0.00
7.00	0.00	0	1,275.00	0.00	0.00	0.00
7.50	0.00	1	1,275.00	0.00	0.00	0.00
8.00	0.01	15	1,275.02	0.00	0.00	0.00
8.50	0.03	43	1,275.04	0.00	0.00	0.00
9.00	0.04	100	1,275.10	0.00	0.00	0.00
9.50	0.06	192	1,275.17	0.00	0.00	0.00
10.00	0.09	320	1,275.25	0.00	0.00	0.00
10.50	0.14	519	1,275.36	0.01	0.01	0.00
11.00	0.24	844	1,275.51	0.01	0.01	0.00
11.50	0.46	1,431	1,275.73	0.01	0.01	0.00
12.00	**8.38**	**5,756**	**1,276.67**	**1.71**	**0.02**	**1.69**
12.50	**1.07**	**6,774**	**1,276.83**	**2.45**	**0.02**	**2.43**
13.00	0.59	5,023	1,276.55	1.20	0.02	1.18
13.50	0.45	4,277	1,276.42	0.72	0.02	0.71
14.00	0.35	3,899	1,276.35	0.51	0.01	0.50
14.50	0.30	3,674	1,276.30	0.40	0.01	0.38
15.00	0.27	3,543	1,276.28	0.33	0.01	0.32
15.50	0.24	3,450	1,276.26	0.29	0.01	0.28
16.00	0.21	3,370	1,276.24	0.26	0.01	0.24
16.50	0.20	3,301	1,276.23	0.23	0.01	0.22
17.00	0.19	3,253	1,276.22	0.21	0.01	0.20
17.50	0.18	3,215	1,276.21	0.20	0.01	0.18
18.00	0.16	3,181	1,276.20	0.18	0.01	0.17
18.50	0.15	3,150	1,276.19	0.17	0.01	0.16
19.00	0.14	3,119	1,276.19	0.16	0.01	0.15
19.50	0.13	3,087	1,276.18	0.15	0.01	0.14
20.00	0.12	3,055	1,276.17	0.14	0.01	0.13

Stage-Discharge for Pond 11P: Infiltration basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
1,275.00	0.00	0.00	0.00
1,275.05	0.00	0.00	0.00
1,275.10	0.00	0.00	0.00
1,275.15	0.00	0.00	0.00
1,275.20	0.00	0.00	0.00
1,275.25	0.00	0.00	0.00
1,275.30	0.01	0.01	0.00
1,275.35	0.01	0.01	0.00
1,275.40	0.01	0.01	0.00
1,275.45	0.01	0.01	0.00
1,275.50	0.01	0.01	0.00
1,275.55	0.01	0.01	0.00
1,275.60	0.01	0.01	0.00
1,275.65	0.01	0.01	0.00
1,275.70	0.01	0.01	0.00
1,275.75	0.01	0.01	0.00
1,275.80	0.01	0.01	0.00
1,275.85	0.01	0.01	0.00
1,275.90	0.01	0.01	0.00
1,275.95	0.01	0.01	0.00
1,276.00	0.01	0.01	0.00
1,276.05	0.02	0.01	0.01
1,276.10	0.06	0.01	0.04
1,276.15	0.11	0.01	0.10
1,276.20	0.18	0.01	0.17
1,276.25	0.27	0.01	0.26
1,276.30	0.38	0.01	0.37
1,276.35	0.51	0.01	0.50
1,276.40	0.66	0.02	0.64
1,276.45	0.82	0.02	0.80
1,276.50	1.00	0.02	0.98
1,276.55	1.19	0.02	1.17
1,276.60	1.39	0.02	1.37
1,276.65	1.61	0.02	1.59
1,276.70	1.84	0.02	1.82
1,276.75	2.08	0.02	2.06
1,276.80	2.32	0.02	2.30
1,276.85	2.58	0.02	2.56
1,276.90	2.84	0.02	2.82
1,276.95	3.11	0.02	3.09
1,277.00	3.39	0.02	3.36
1,277.05	4.19	0.02	4.17
1,277.10	5.44	0.02	5.42
1,277.15	6.98	0.02	6.96
1,277.20	8.74	0.02	8.72
1,277.25	10.80	0.02	10.78
1,277.30	13.10	0.03	13.07
1,277.35	15.61	0.03	15.58
1,277.40	18.34	0.03	18.31
1,277.45	21.25	0.03	21.22
1,277.50	24.34	0.03	24.31
1,277.55	27.68	0.03	27.65
1,277.60	31.23	0.03	31.20
1,277.65	34.57	0.03	34.54
1,277.70	38.03	0.03	38.00
1,277.75	41.59	0.03	41.56
1,277.80	45.27	0.03	45.24
1,277.85	49.04	0.03	49.01
1,277.90	52.91	0.03	52.88
1,277.95	56.88	0.03	56.85
1,278.00	**60.94**	**0.03**	**60.91**

Stage-Area-Storage for Pond 11P: Infiltration basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,275.00	898	0
1,275.05	1,043	49
1,275.10	1,187	104
1,275.15	1,332	167
1,275.20	1,477	237
1,275.25	1,621	315
1,275.30	1,766	400
1,275.35	1,911	491
1,275.40	2,055	591
1,275.45	2,200	697
1,275.50	2,345	811
1,275.55	2,489	931
1,275.60	2,634	1,060
1,275.65	2,778	1,195
1,275.70	2,923	1,337
1,275.75	3,068	1,487
1,275.80	3,212	1,644
1,275.85	3,357	1,808
1,275.90	3,502	1,980
1,275.95	3,646	2,159
1,276.00	3,791	2,345
1,276.05	3,982	2,539
1,276.10	4,173	2,743
1,276.15	4,365	2,956
1,276.20	4,556	3,179
1,276.25	4,747	3,412
1,276.30	4,938	3,654
1,276.35	5,130	3,906
1,276.40	5,321	4,167
1,276.45	5,512	4,438
1,276.50	5,703	4,718
1,276.55	5,894	5,008
1,276.60	6,086	5,308
1,276.65	6,277	5,617
1,276.70	6,468	5,935
1,276.75	6,659	6,263
1,276.80	6,851	6,601
1,276.85	7,042	6,948
1,276.90	7,233	7,305
1,276.95	7,424	7,672
1,277.00	7,616	8,048
1,277.05	7,807	8,433
1,277.10	7,998	8,828
1,277.15	8,189	9,233
1,277.20	8,380	9,647
1,277.25	8,572	10,071
1,277.30	8,763	10,505
1,277.35	8,954	10,947
1,277.40	9,145	11,400
1,277.45	9,337	11,862
1,277.50	9,528	12,334
1,277.55	9,719	12,815
1,277.60	9,910	13,305
1,277.65	10,101	13,806
1,277.70	10,293	14,316
1,277.75	10,484	14,835
1,277.80	10,675	15,364
1,277.85	10,866	15,903
1,277.90	11,058	16,451
1,277.95	11,249	17,008
1,278.00	**11,440**	**17,576**

Summary for Pond 13P: Wet Pond

Inflow Area =	5.950 ac,	0.00% Impervious,	Inflow Depth >	3.81"	for 50yr event
Inflow =	37.81 cfs @	12.00 hrs,	Volume=	1.891 af	
Outflow =	0.03 cfs @	20.00 hrs,	Volume=	0.013 af,	Atten= 100%, Lag= 480.3 min
Primary =	0.03 cfs @	20.00 hrs,	Volume=	0.013 af	
Secondary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,291.50' @ 20.00 hrs Surf.Area= 32,241 sf Storage= 81,757 cf

Plug-Flow detention time= 590.7 min calculated for 0.013 af (1% of inflow)
Center-of-Mass det. time= 229.4 min (996.2 - 766.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,288.50'	214,237 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

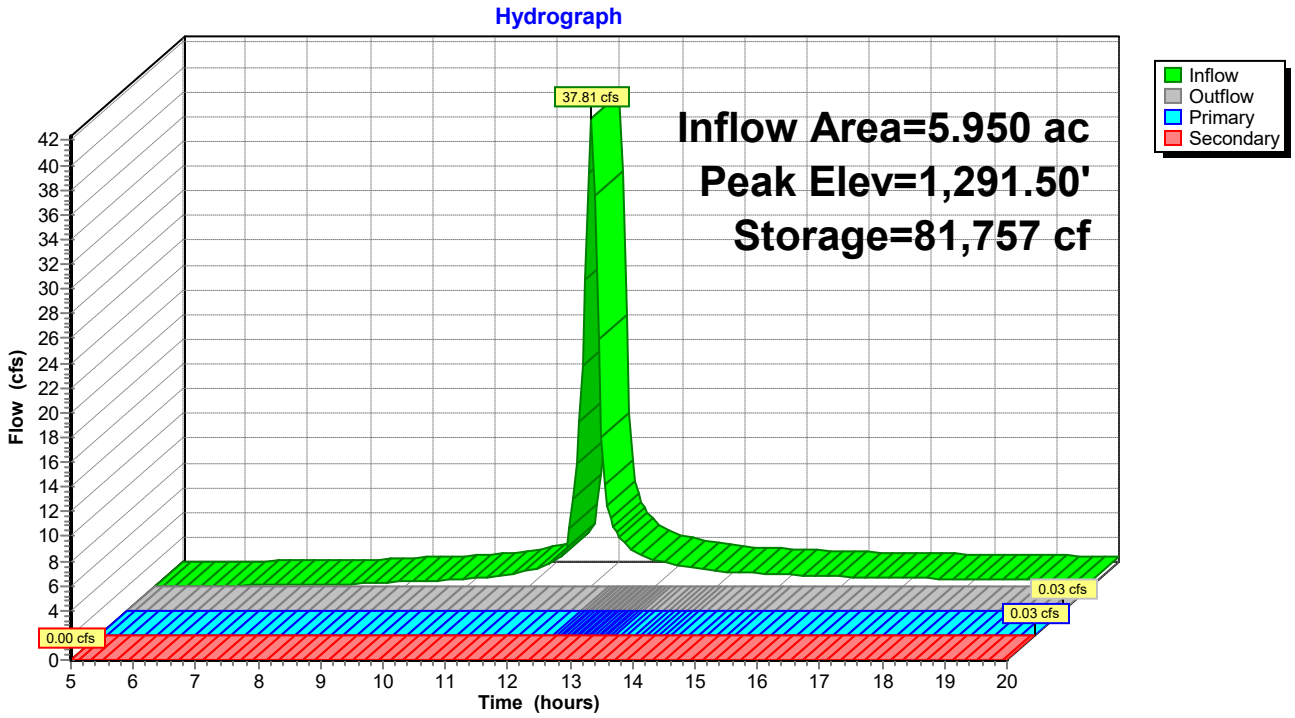
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,288.50	22,471	0	0
1,290.00	27,127	37,199	37,199
1,292.00	33,940	61,067	98,266
1,294.00	40,276	74,216	172,482
1,295.00	43,234	41,755	214,237

Device	Routing	Invert	Outlet Devices
#1	Primary	1,289.50'	**15.0" Round Pipe** L= 100.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,289.50' / 1,289.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,290.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,291.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1,292.00'	**1.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	1,293.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

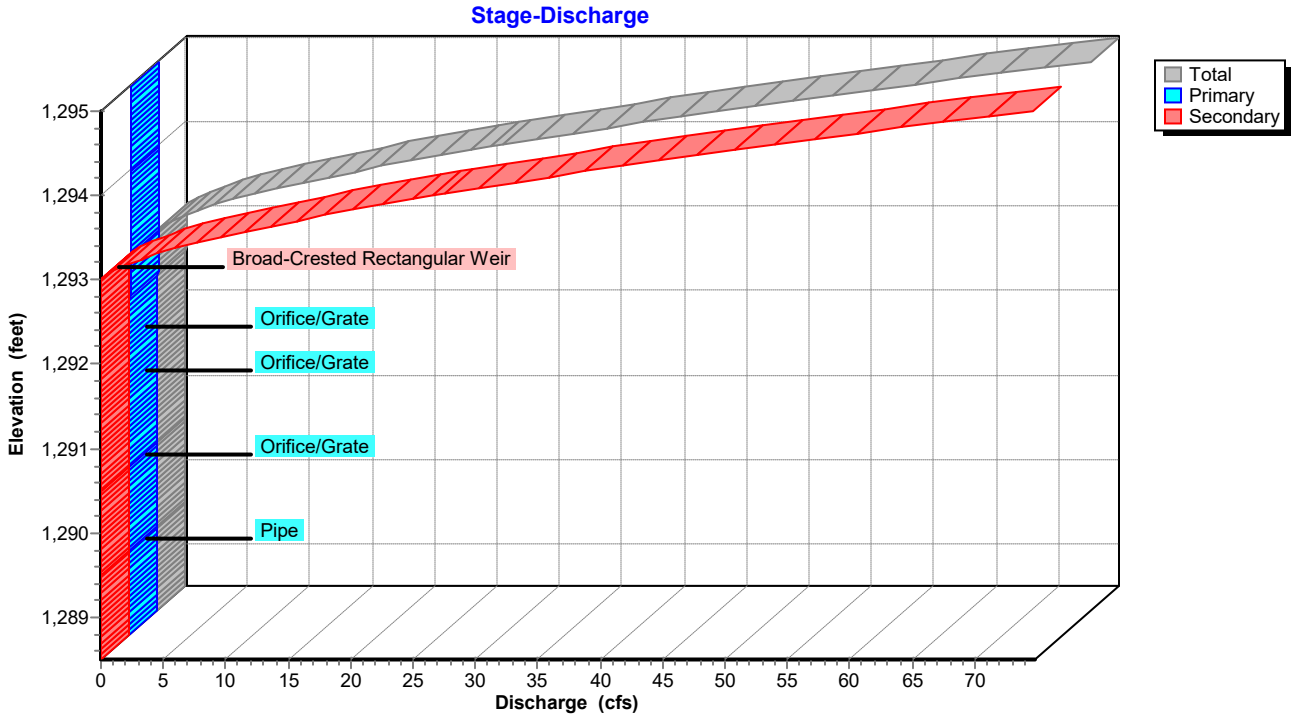
Primary OutFlow Max=0.03 cfs @ 20.00 hrs HW=1,291.50' (Free Discharge)
└─**1=Pipe** (Passes 0.03 cfs of 5.63 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.72 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.11 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 13P: Wet Pond



Pond 13P: Wet Pond



Hydrograph for Pond 13P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.00	0.00	0	1,288.50	0.00	0.00	**0.00**
5.50	0.02	7	1,288.50	0.00	0.00	0.00
6.00	0.05	63	1,288.50	0.00	0.00	0.00
6.50	0.08	178	1,288.51	0.00	0.00	0.00
7.00	0.12	357	1,288.52	0.00	0.00	0.00
7.50	0.16	605	1,288.53	0.00	0.00	0.00
8.00	0.20	925	1,288.54	0.00	0.00	0.00
8.50	0.27	1,343	1,288.56	0.00	0.00	0.00
9.00	0.38	1,928	1,288.59	0.00	0.00	0.00
9.50	0.45	2,686	1,288.62	0.00	0.00	0.00
10.00	0.60	3,606	1,288.66	0.00	0.00	0.00
10.50	0.86	4,895	1,288.71	0.00	0.00	0.00
11.00	1.31	6,804	1,288.80	0.00	0.00	0.00
11.50	2.36	9,976	1,288.93	0.00	0.00	0.00
12.00	**37.77**	34,602	1,289.90	0.00	0.00	0.00
12.50	3.67	55,800	1,290.66	0.01	0.01	0.00
13.00	2.15	60,592	1,290.82	0.01	0.01	0.00
13.50	1.62	63,900	1,290.93	0.02	0.02	0.00
14.00	1.27	66,450	1,291.01	0.02	0.02	0.00
14.50	1.11	68,524	1,291.08	0.02	0.02	0.00
15.00	1.00	70,383	1,291.14	0.02	0.02	0.00
15.50	0.89	72,042	1,291.19	0.02	0.02	0.00
16.00	0.78	73,499	1,291.24	0.02	0.02	0.00
16.50	0.72	74,790	1,291.28	0.02	0.02	0.00
17.00	0.68	76,003	1,291.32	0.02	0.02	0.00
17.50	0.64	77,145	1,291.36	0.02	0.02	0.00
18.00	0.60	78,213	1,291.39	0.02	0.02	0.00
18.50	0.56	79,209	1,291.42	0.02	0.02	0.00
19.00	0.52	80,132	1,291.45	0.03	0.03	0.00
19.50	0.48	80,981	1,291.48	0.03	0.03	0.00
20.00	0.44	**81,757**	**1,291.50**	**0.03**	**0.03**	0.00

Stage-Discharge for Pond 13P: Wet Pond

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
1,288.50	0.00	0.00	0.00
1,288.60	0.00	0.00	0.00
1,288.70	0.00	0.00	0.00
1,288.80	0.00	0.00	0.00
1,288.90	0.00	0.00	0.00
1,289.00	0.00	0.00	0.00
1,289.10	0.00	0.00	0.00
1,289.20	0.00	0.00	0.00
1,289.30	0.00	0.00	0.00
1,289.40	0.00	0.00	0.00
1,289.50	0.00	0.00	0.00
1,289.60	0.00	0.00	0.00
1,289.70	0.00	0.00	0.00
1,289.80	0.00	0.00	0.00
1,289.90	0.00	0.00	0.00
1,290.00	0.00	0.00	0.00
1,290.10	0.00	0.00	0.00
1,290.20	0.00	0.00	0.00
1,290.30	0.00	0.00	0.00
1,290.40	0.00	0.00	0.00
1,290.50	0.00	0.00	0.00
1,290.60	0.01	0.01	0.00
1,290.70	0.01	0.01	0.00
1,290.80	0.01	0.01	0.00
1,290.90	0.02	0.02	0.00
1,291.00	0.02	0.02	0.00
1,291.10	0.02	0.02	0.00
1,291.20	0.02	0.02	0.00
1,291.30	0.02	0.02	0.00
1,291.40	0.02	0.02	0.00
1,291.50	0.03	0.03	0.00
1,291.60	0.03	0.03	0.00
1,291.70	0.04	0.04	0.00
1,291.80	0.04	0.04	0.00
1,291.90	0.05	0.05	0.00
1,292.00	0.05	0.05	0.00
1,292.10	0.06	0.06	0.00
1,292.20	0.07	0.07	0.00
1,292.30	0.07	0.07	0.00
1,292.40	0.08	0.08	0.00
1,292.50	0.08	0.08	0.00
1,292.60	0.08	0.08	0.00
1,292.70	0.09	0.09	0.00
1,292.80	0.09	0.09	0.00
1,292.90	0.10	0.10	0.00
1,293.00	0.10	0.10	0.00
1,293.10	0.91	0.10	0.81
1,293.20	2.40	0.10	2.30
1,293.30	4.37	0.11	4.26
1,293.40	6.74	0.11	6.63
1,293.50	9.52	0.11	9.40
1,293.60	12.66	0.12	12.55
1,293.70	15.84	0.12	15.73
1,293.80	19.23	0.12	19.10
1,293.90	22.88	0.12	22.75
1,294.00	26.73	0.13	26.60
1,294.10	30.88	0.13	30.75
1,294.20	35.23	0.13	35.10
1,294.30	39.64	0.13	39.50
1,294.40	44.20	0.14	44.06
1,294.50	48.82	0.14	48.68
1,294.60	53.57	0.14	53.43
1,294.70	58.66	0.14	58.52
1,294.80	63.90	0.15	63.75
1,294.90	69.29	0.15	69.14
1,295.00	**74.82**	**0.15**	**74.67**

Stage-Area-Storage for Pond 13P: Wet Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,288.50	22,471	0
1,288.60	22,781	2,263
1,288.70	23,092	4,556
1,288.80	23,402	6,881
1,288.90	23,713	9,237
1,289.00	24,023	11,624
1,289.10	24,333	14,041
1,289.20	24,644	16,490
1,289.30	24,954	18,970
1,289.40	25,265	21,481
1,289.50	25,575	24,023
1,289.60	25,885	26,596
1,289.70	26,196	29,200
1,289.80	26,506	31,835
1,289.90	26,817	34,501
1,290.00	27,127	37,199
1,290.10	27,468	39,928
1,290.20	27,808	42,692
1,290.30	28,149	45,490
1,290.40	28,490	48,322
1,290.50	28,830	51,188
1,290.60	29,171	54,088
1,290.70	29,512	57,022
1,290.80	29,852	59,990
1,290.90	30,193	62,992
1,291.00	30,534	66,029
1,291.10	30,874	69,099
1,291.20	31,215	72,204
1,291.30	31,555	75,342
1,291.40	31,896	78,515
1,291.50	32,237	81,721
1,291.60	32,577	84,962
1,291.70	32,918	88,237
1,291.80	33,259	91,546
1,291.90	33,599	94,889
1,292.00	33,940	98,266
1,292.10	34,257	101,675
1,292.20	34,574	105,117
1,292.30	34,890	108,590
1,292.40	35,207	112,095
1,292.50	35,524	115,632
1,292.60	35,841	119,200
1,292.70	36,158	122,800
1,292.80	36,474	126,431
1,292.90	36,791	130,095
1,293.00	37,108	133,790
1,293.10	37,425	137,516
1,293.20	37,742	141,274
1,293.30	38,058	145,064
1,293.40	38,375	148,886
1,293.50	38,692	152,740
1,293.60	39,009	156,625
1,293.70	39,326	160,541
1,293.80	39,642	164,490
1,293.90	39,959	168,470
1,294.00	40,276	172,482
1,294.10	40,572	176,524
1,294.20	40,868	180,596
1,294.30	41,163	184,697
1,294.40	41,459	188,829
1,294.50	41,755	192,989
1,294.60	42,051	197,180
1,294.70	42,347	201,399
1,294.80	42,642	205,649
1,294.90	42,938	209,928
1,295.00	**43,234**	**214,237**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 14S: DA-2 Runoff Area=1.770 ac 0.00% Impervious Runoff Depth>3.92"
Flow Length=369' Tc=11.1 min CN=77 Runoff=10.80 cfs 0.578 af

Subcatchment 18S: DA-3 Runoff Area=5.950 ac 0.00% Impervious Runoff Depth>4.67"
Flow Length=1,299' Tc=8.5 min CN=84 Runoff=45.69 cfs 2.314 af

Subcatchment 19S: DA-1 Runoff Area=3.440 ac 0.00% Impervious Runoff Depth>3.30"
Flow Length=1,020' Tc=16.5 min CN=71 Runoff=15.15 cfs 0.946 af

Subcatchment 20S: DA-4 Runoff Area=8.487 ac 0.00% Impervious Runoff Depth>3.69"
Flow Length=1,190' Tc=27.7 min CN=75 Runoff=31.02 cfs 2.610 af

Reach 6R: Reach Inflow=49.54 cfs 4.074 af
Outflow=49.54 cfs 4.074 af

Pond 11P: Infiltration basin Peak Elev=1,277.15' Storage=9,223 cf Inflow=10.80 cfs 0.578 af
Discarded=0.02 cfs 0.012 af Primary=6.92 cfs 0.494 af Outflow=6.94 cfs 0.506 af

Pond 13P: Wet Pond Peak Elev=1,292.04' Storage=99,690 cf Inflow=45.69 cfs 2.314 af
Primary=0.05 cfs 0.025 af Secondary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.025 af

Total Runoff Area = 19.647 ac Runoff Volume = 6.448 af Average Runoff Depth = 3.94"
100.00% Pervious = 19.647 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 14S: DA-2

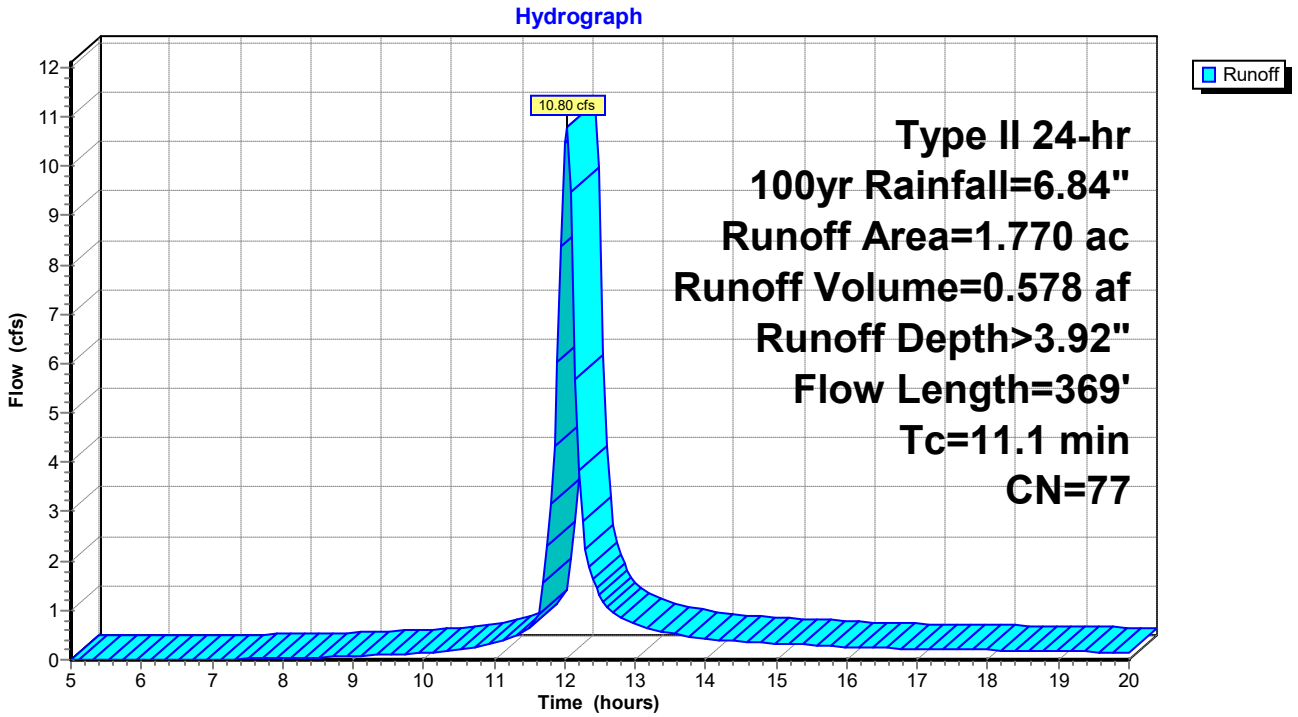
Runoff = 10.80 cfs @ 12.03 hrs, Volume= 0.578 af, Depth> 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=6.84"

	Area (ac)	CN	Description
*	0.545	89	Gravel, HSG C
	1.225	71	Meadow, non-grazed, HSG C
	1.770	77	Weighted Average
	1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0400	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	175	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	54	0.0750	1.37		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.1	369	Total			

Subcatchment 14S: DA-2



Hydrograph for Subcatchment 14S: DA-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.43	0.00	0.00
5.25	0.46	0.00	0.00
5.50	0.49	0.00	0.00
5.75	0.52	0.00	0.00
6.00	0.55	0.00	0.00
6.25	0.58	0.00	0.00
6.50	0.61	0.00	0.00
6.75	0.64	0.00	0.00
7.00	0.68	0.00	0.01
7.25	0.71	0.00	0.01
7.50	0.75	0.01	0.02
7.75	0.78	0.01	0.03
8.00	0.82	0.02	0.03
8.25	0.86	0.02	0.04
8.50	0.90	0.03	0.05
8.75	0.95	0.04	0.06
9.00	1.01	0.05	0.08
9.25	1.06	0.06	0.09
9.50	1.11	0.08	0.10
9.75	1.17	0.09	0.11
10.00	1.24	0.11	0.14
10.25	1.31	0.14	0.17
10.50	1.40	0.17	0.21
10.75	1.49	0.21	0.26
11.00	1.61	0.26	0.33
11.25	1.75	0.32	0.44
11.50	1.94	0.41	0.62
11.75	2.65	0.83	2.29
12.00	4.53	2.24	**10.47**
12.25	4.83	2.48	**2.80**
12.50	5.03	2.65	1.31
12.75	5.17	2.76	0.87
13.00	5.28	2.86	0.72
13.25	5.38	2.94	0.61
13.50	5.47	3.02	0.54
13.75	5.54	3.08	0.48
14.00	5.61	3.14	0.42
14.25	5.67	3.19	0.38
14.50	5.73	3.24	0.37
14.75	5.79	3.29	0.35
15.00	5.84	3.34	0.33
15.25	5.89	3.38	0.31
15.50	5.93	3.42	0.29
15.75	5.98	3.46	0.28
16.00	6.02	3.50	0.26
16.25	6.06	3.53	0.24
16.50	6.10	3.56	0.24
16.75	6.13	3.59	0.23
17.00	6.17	3.63	0.22
17.25	6.20	3.66	0.22
17.50	6.24	3.69	0.21
17.75	6.27	3.71	0.20
18.00	6.30	3.74	0.20
18.25	6.33	3.77	0.19
18.50	6.36	3.79	0.19
18.75	6.39	3.82	0.18
19.00	6.41	3.84	0.17
19.25	6.44	3.87	0.17
19.50	6.47	3.89	0.16
19.75	6.49	3.91	0.15
20.00	**6.51**	**3.93**	0.15

Summary for Subcatchment 18S: DA-3

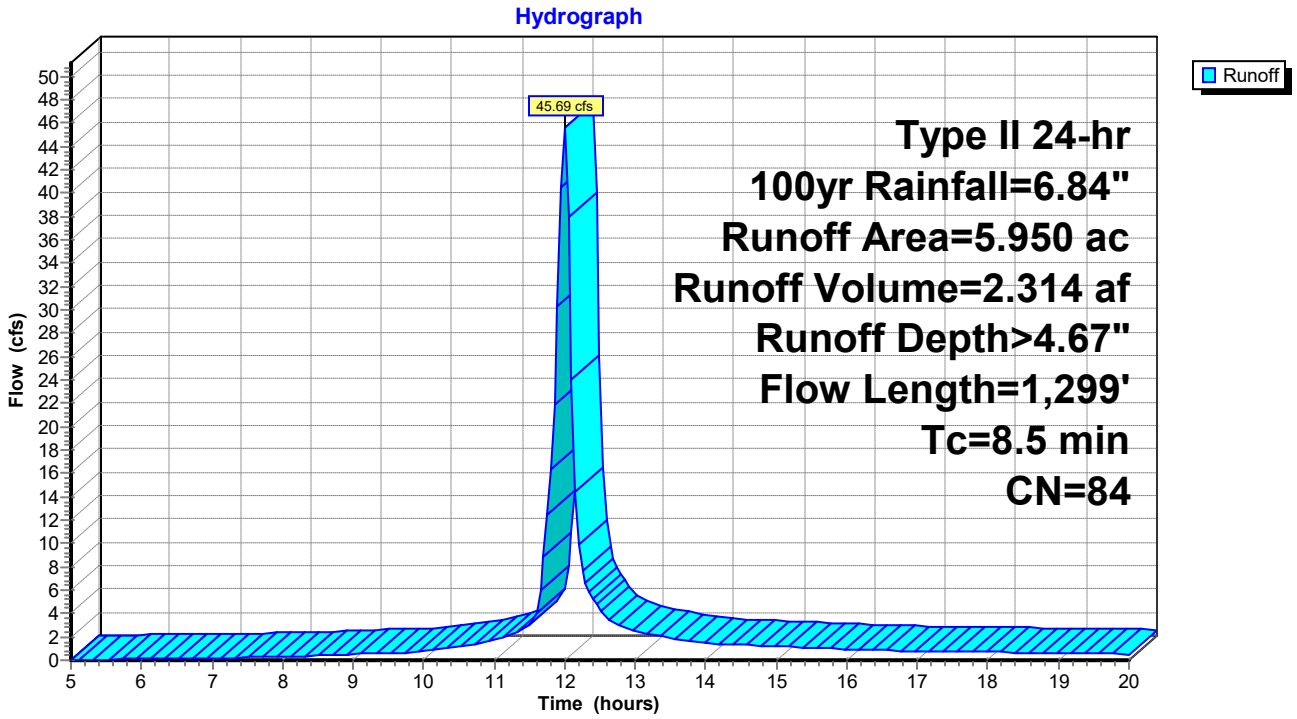
Runoff = 45.69 cfs @ 11.99 hrs, Volume= 2.314 af, Depth> 4.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=6.84"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
3.757	89	Gravel roads, HSG C
0.363	91	Gravel roads, HSG D
5.950	84	Weighted Average
5.950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	412	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	330	0.0320	2.28	3.19	**Channel Flow,** Area= 1.4 sf Perim= 5.3' r= 0.26' n= 0.048
2.7	557	0.0200	3.47	10.08	**Channel Flow,** Area= 2.9 sf Perim= 5.6' r= 0.52' n= 0.039
8.5	1,299	Total			

Subcatchment 18S: DA-3



Hydrograph for Subcatchment 18S: DA-3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.43	0.00	0.02
5.25	0.46	0.00	0.04
5.50	0.49	0.01	0.06
5.75	0.52	0.01	0.08
6.00	0.55	0.01	0.10
6.25	0.58	0.02	0.12
6.50	0.61	0.02	0.15
6.75	0.64	0.03	0.17
7.00	0.68	0.04	0.19
7.25	0.71	0.05	0.22
7.50	0.75	0.06	0.24
7.75	0.78	0.07	0.27
8.00	0.82	0.08	0.29
8.25	0.86	0.10	0.33
8.50	0.90	0.11	0.39
8.75	0.95	0.13	0.46
9.00	1.01	0.15	0.53
9.25	1.06	0.18	0.58
9.50	1.11	0.20	0.61
9.75	1.17	0.23	0.68
10.00	1.24	0.27	0.80
10.25	1.31	0.31	0.94
10.50	1.40	0.35	1.12
10.75	1.49	0.41	1.37
11.00	1.61	0.48	1.68
11.25	1.75	0.57	2.21
11.50	1.94	0.70	2.99
11.75	2.65	1.23	12.39
12.00	4.53	2.85	**45.63**
12.25	4.83	3.12	7.72
12.50	5.03	3.30	4.38
12.75	5.17	3.42	3.06
13.00	5.28	3.53	2.56
13.25	5.38	3.62	2.19
13.50	5.47	3.70	1.92
13.75	5.54	3.77	1.70
14.00	5.61	3.83	1.51
14.25	5.67	3.89	1.38
14.50	5.73	3.94	1.31
14.75	5.79	4.00	1.25
15.00	5.84	4.05	1.18
15.25	5.89	4.09	1.12
15.50	5.93	4.14	1.05
15.75	5.98	4.18	0.99
16.00	6.02	4.21	0.92
16.25	6.06	4.25	0.87
16.50	6.10	4.29	0.85
16.75	6.13	4.32	0.83
17.00	6.17	4.35	0.80
17.25	6.20	4.39	0.78
17.50	6.24	4.42	0.75
17.75	6.27	4.45	0.73
18.00	6.30	4.48	0.71
18.25	6.33	4.51	0.68
18.50	6.36	4.53	0.66
18.75	6.39	4.56	0.64
19.00	6.41	4.59	0.61
19.25	6.44	4.61	0.59
19.50	6.47	4.63	0.56
19.75	6.49	4.66	0.54
20.00	**6.51**	**4.68**	0.52

Summary for Subcatchment 19S: DA-1

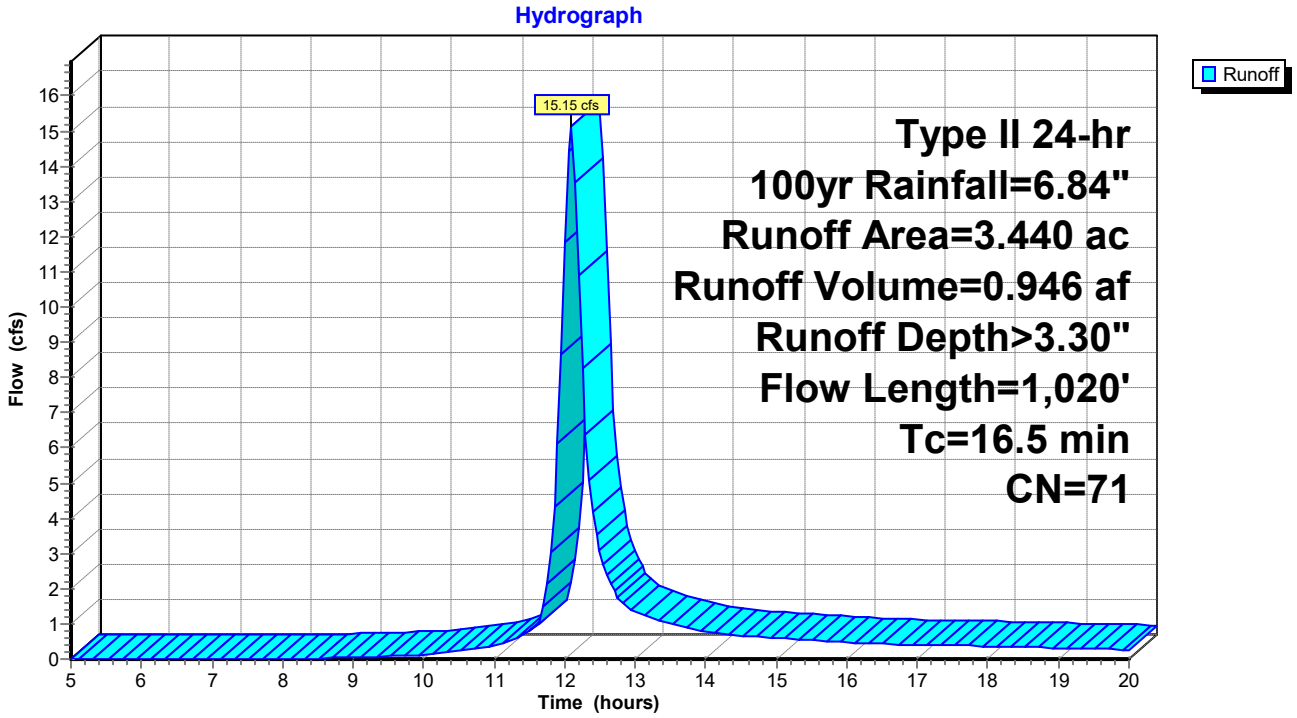
Runoff = 15.15 cfs @ 12.09 hrs, Volume= 0.946 af, Depth> 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=6.84"

Area (ac)	CN	Description
3.440	71	Meadow, non-grazed, HSG C
3.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.88"
9.8	920	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.5	1,020	Total			

Subcatchment 19S: DA-1



Hydrograph for Subcatchment 19S: DA-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.43	0.00	0.00
5.25	0.46	0.00	0.00
5.50	0.49	0.00	0.00
5.75	0.52	0.00	0.00
6.00	0.55	0.00	0.00
6.25	0.58	0.00	0.00
6.50	0.61	0.00	0.00
6.75	0.64	0.00	0.00
7.00	0.68	0.00	0.00
7.25	0.71	0.00	0.00
7.50	0.75	0.00	0.00
7.75	0.78	0.00	0.00
8.00	0.82	0.00	0.00
8.25	0.86	0.00	0.00
8.50	0.90	0.00	0.01
8.75	0.95	0.00	0.03
9.00	1.01	0.01	0.04
9.25	1.06	0.01	0.06
9.50	1.11	0.02	0.08
9.75	1.17	0.03	0.10
10.00	1.24	0.04	0.13
10.25	1.31	0.05	0.17
10.50	1.40	0.07	0.22
10.75	1.49	0.10	0.29
11.00	1.61	0.13	0.39
11.25	1.75	0.17	0.53
11.50	1.94	0.24	0.77
11.75	2.65	0.57	2.13
12.00	4.53	1.77	**11.82**
12.25	4.83	1.99	**8.28**
12.50	5.03	2.14	3.08
12.75	5.17	2.24	1.77
13.00	5.28	2.33	1.36
13.25	5.38	2.41	1.14
13.50	5.47	2.47	1.00
13.75	5.54	2.53	0.88
14.00	5.61	2.59	0.78
14.25	5.67	2.64	0.70
14.50	5.73	2.68	0.66
14.75	5.79	2.73	0.63
15.00	5.84	2.77	0.60
15.25	5.89	2.81	0.57
15.50	5.93	2.85	0.54
15.75	5.98	2.88	0.51
16.00	6.02	2.91	0.47
16.25	6.06	2.95	0.44
16.50	6.10	2.98	0.43
16.75	6.13	3.01	0.42
17.00	6.17	3.03	0.41
17.25	6.20	3.06	0.40
17.50	6.24	3.09	0.38
17.75	6.27	3.12	0.37
18.00	6.30	3.14	0.36
18.25	6.33	3.17	0.35
18.50	6.36	3.19	0.34
18.75	6.39	3.21	0.33
19.00	6.41	3.24	0.31
19.25	6.44	3.26	0.30
19.50	6.47	3.28	0.29
19.75	6.49	3.30	0.28
20.00	**6.51**	**3.32**	0.27

Summary for Subcatchment 20S: DA-4

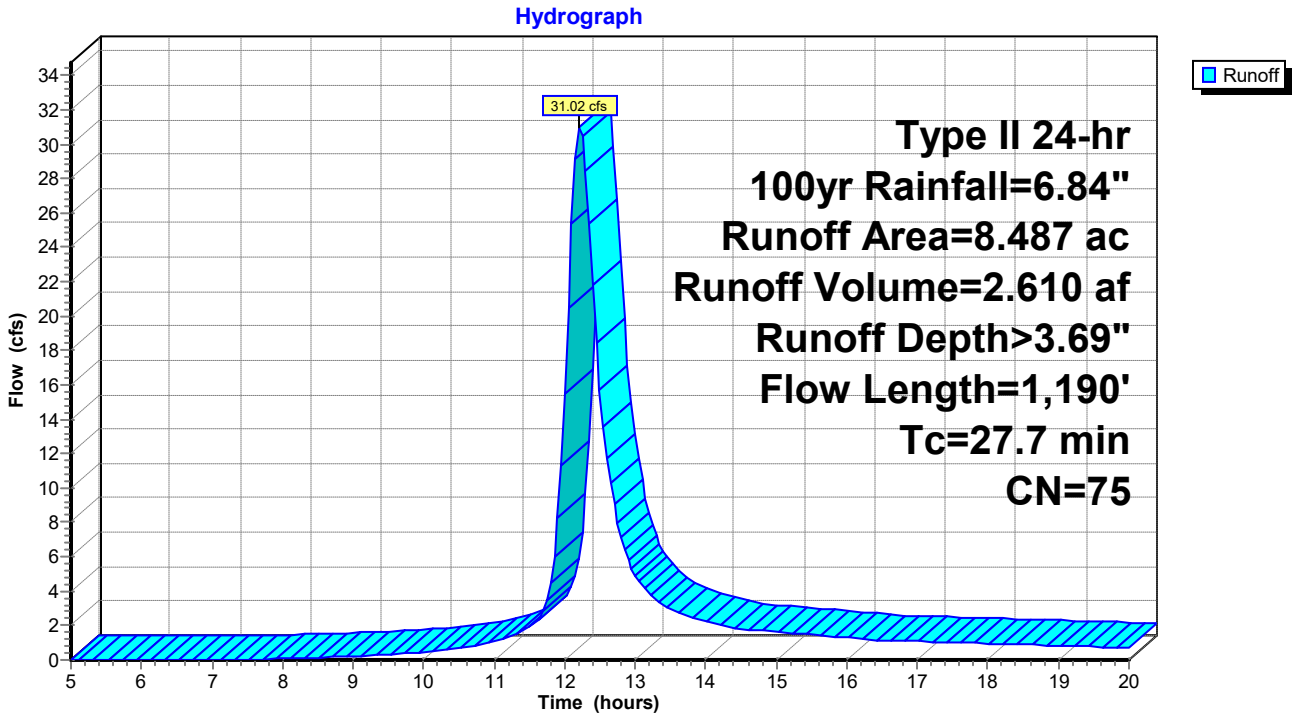
Runoff = 31.02 cfs @ 12.22 hrs, Volume= 2.610 af, Depth> 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=6.84"

Area (ac)	CN	Description
3.538	71	Meadow, non-grazed, HSG C
4.312	78	Meadow, non-grazed, HSG D
0.427	73	Woods, Fair, HSG C
0.210	79	Woods, Fair, HSG D
8.487	75	Weighted Average
8.487		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.88"
4.4	370	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	526	0.0250	1.56	1.87	**Channel Flow,** Area= 1.2 sf Perim= 4.9' r= 0.24' n= 0.059
2.0	194	0.0510	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.7	1,190	Total			

Subcatchment 20S: DA-4



Hydrograph for Subcatchment 20S: DA-4

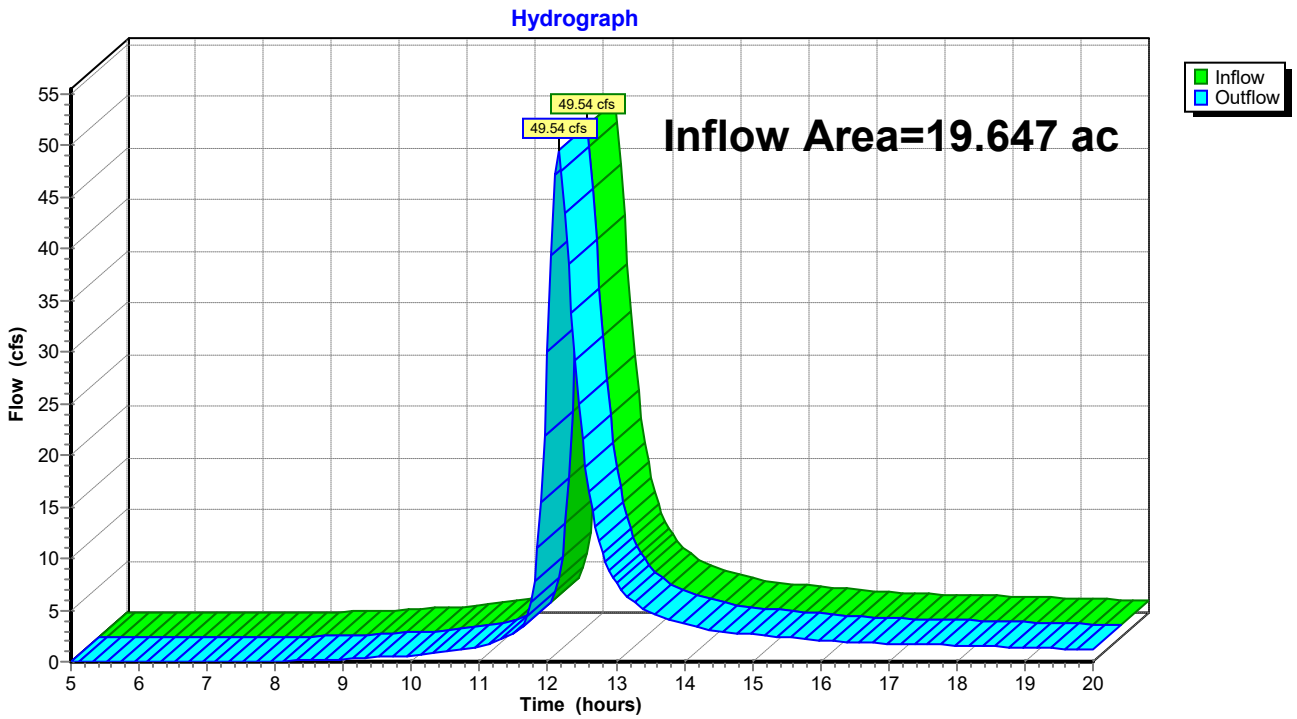
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.43	0.00	0.00
5.25	0.46	0.00	0.00
5.50	0.49	0.00	0.00
5.75	0.52	0.00	0.00
6.00	0.55	0.00	0.00
6.25	0.58	0.00	0.00
6.50	0.61	0.00	0.00
6.75	0.64	0.00	0.00
7.00	0.68	0.00	0.00
7.25	0.71	0.00	0.00
7.50	0.75	0.00	0.02
7.75	0.78	0.00	0.04
8.00	0.82	0.01	0.07
8.25	0.86	0.01	0.09
8.50	0.90	0.02	0.13
8.75	0.95	0.02	0.17
9.00	1.01	0.03	0.22
9.25	1.06	0.04	0.28
9.50	1.11	0.05	0.34
9.75	1.17	0.07	0.39
10.00	1.24	0.08	0.46
10.25	1.31	0.10	0.56
10.50	1.40	0.13	0.69
10.75	1.49	0.16	0.87
11.00	1.61	0.21	1.11
11.25	1.75	0.27	1.43
11.50	1.94	0.35	1.96
11.75	2.65	0.74	3.47
12.00	4.53	2.08	**15.53**
12.25	4.83	2.31	**30.49**
12.50	5.03	2.47	15.71
12.75	5.17	2.58	8.00
13.00	5.28	2.68	4.92
13.25	5.38	2.76	3.63
13.50	5.47	2.83	2.94
13.75	5.54	2.89	2.55
14.00	5.61	2.95	2.24
14.25	5.67	3.00	2.00
14.50	5.73	3.05	1.83
14.75	5.79	3.10	1.72
15.00	5.84	3.14	1.63
15.25	5.89	3.19	1.55
15.50	5.93	3.23	1.46
15.75	5.98	3.26	1.38
16.00	6.02	3.30	1.29
16.25	6.06	3.33	1.21
16.50	6.10	3.36	1.15
16.75	6.13	3.40	1.11
17.00	6.17	3.43	1.08
17.25	6.20	3.46	1.05
17.50	6.24	3.48	1.02
17.75	6.27	3.51	0.99
18.00	6.30	3.54	0.96
18.25	6.33	3.56	0.93
18.50	6.36	3.59	0.90
18.75	6.39	3.61	0.87
19.00	6.41	3.64	0.84
19.25	6.44	3.66	0.81
19.50	6.47	3.68	0.78
19.75	6.49	3.70	0.75
20.00	**6.51**	**3.72**	0.71

Summary for Reach 6R: Reach

Inflow Area = 19.647 ac, 0.00% Impervious, Inflow Depth > 2.49" for 100yr event
Inflow = 49.54 cfs @ 12.15 hrs, Volume= 4.074 af
Outflow = 49.54 cfs @ 12.15 hrs, Volume= 4.074 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Reach



Hydrograph for Reach 6R: Reach

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00	17.75	1.62		1.62
5.25	0.00		0.00	18.00	1.57		1.57
5.50	0.00		0.00	18.25	1.52		1.52
5.75	0.00		0.00	18.50	1.48		1.48
6.00	0.00		0.00	18.75	1.43		1.43
6.25	0.00		0.00	19.00	1.38		1.38
6.50	0.00		0.00	19.25	1.33		1.33
6.75	0.00		0.00	19.50	1.28		1.28
7.00	0.00		0.00	19.75	1.23		1.23
7.25	0.00		0.00	20.00	1.19		1.19
7.50	0.02		0.02				
7.75	0.04		0.04				
8.00	0.07		0.07				
8.25	0.09		0.09				
8.50	0.14		0.14				
8.75	0.20		0.20				
9.00	0.27		0.27				
9.25	0.35		0.35				
9.50	0.42		0.42				
9.75	0.49		0.49				
10.00	0.59		0.59				
10.25	0.73		0.73				
10.50	0.92		0.92				
10.75	1.16		1.16				
11.00	1.49		1.49				
11.25	1.96		1.96				
11.50	2.73		2.73				
11.75	5.74		5.74				
12.00	**30.12**		**30.12**				
12.25	**43.38**		**43.38**				
12.50	21.55		21.55				
12.75	11.68		11.68				
13.00	7.67		7.67				
13.25	5.83		5.83				
13.50	4.79		4.79				
13.75	4.14		4.14				
14.00	3.64		3.64				
14.25	3.24		3.24				
14.50	2.97		2.97				
14.75	2.80		2.80				
15.00	2.65		2.65				
15.25	2.51		2.51				
15.50	2.37		2.37				
15.75	2.23		2.23				
16.00	2.10		2.10				
16.25	1.97		1.97				
16.50	1.88		1.88				
16.75	1.82		1.82				
17.00	1.77		1.77				
17.25	1.72		1.72				
17.50	1.67		1.67				

Summary for Pond 11P: Infiltration basin

Inflow Area =	1.770 ac,	0.00% Impervious,	Inflow Depth >	3.92"	for 100yr event
Inflow =	10.80 cfs @	12.03 hrs,	Volume=	0.578 af	
Outflow =	6.94 cfs @	12.13 hrs,	Volume=	0.506 af,	Atten= 36%, Lag= 6.0 min
Discarded =	0.02 cfs @	12.13 hrs,	Volume=	0.012 af	
Primary =	6.92 cfs @	12.13 hrs,	Volume=	0.494 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 1,277.15' @ 12.13 hrs Surf.Area= 8,184 sf Storage= 9,223 cf

Plug-Flow detention time= 78.6 min calculated for 0.504 af (87% of inflow)
Center-of-Mass det. time= 39.4 min (817.9 - 778.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,275.00'	17,576 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

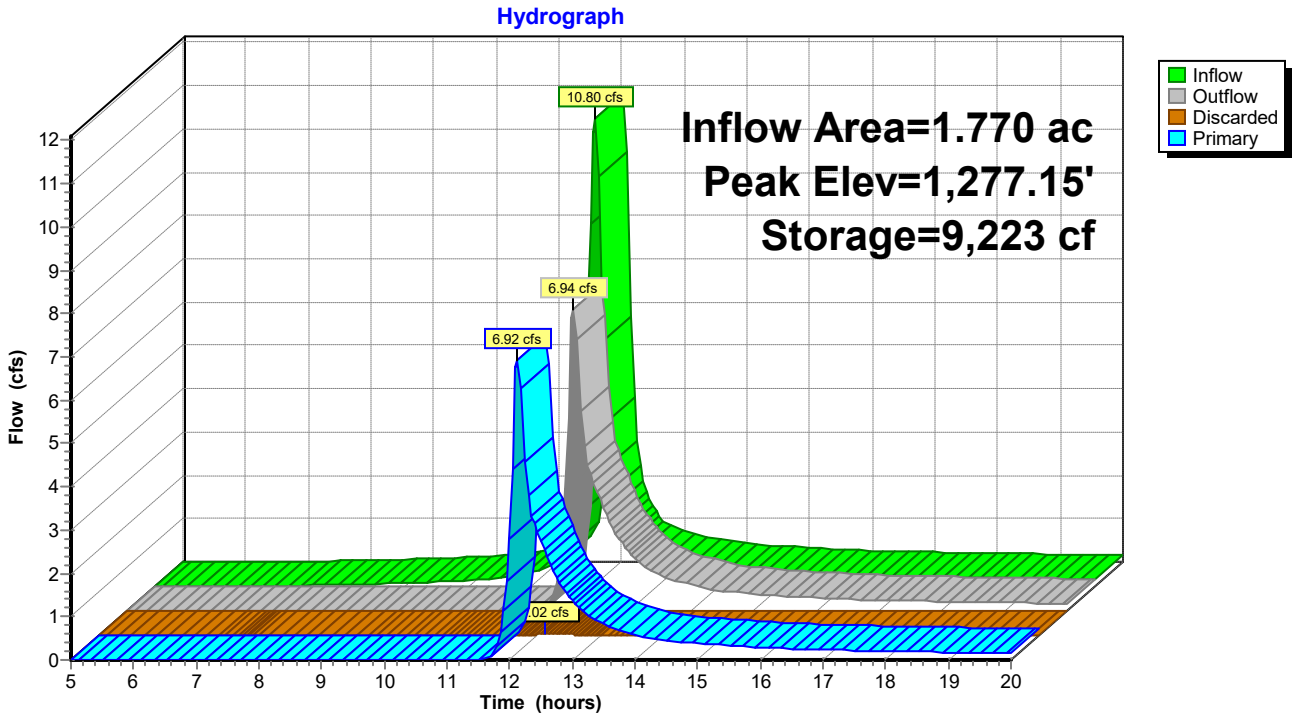
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,275.00	898	0	0
1,276.00	3,791	2,345	2,345
1,278.00	11,440	15,231	17,576

Device	Routing	Invert	Outlet Devices
#1	Primary	1,276.00'	**18.0" Round Pipe** L= 25.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,276.00' / 1,272.00' S= 0.1600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	1,275.00'	**0.125 in/hr Exfiltration over Surface area**
#3	Primary	1,277.00'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

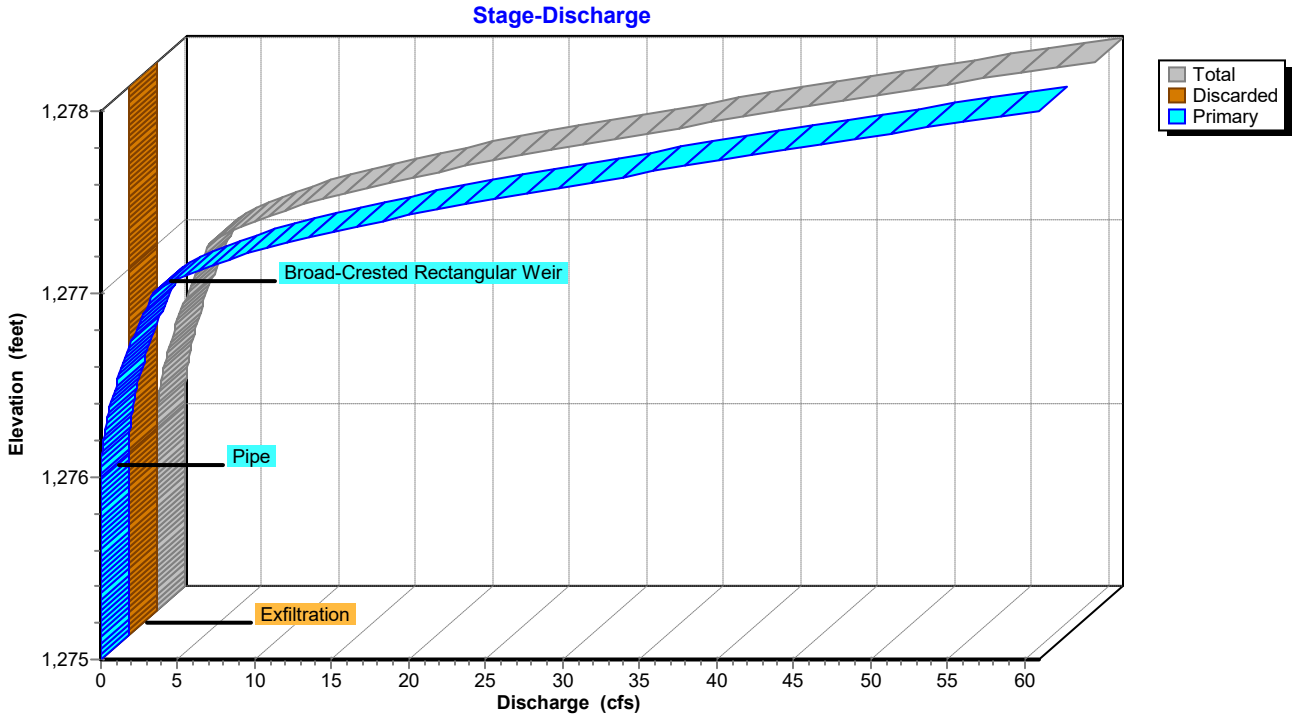
Discarded OutFlow Max=0.02 cfs @ 12.13 hrs HW=1,277.14' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=6.77 cfs @ 12.13 hrs HW=1,277.14' (Free Discharge)
├─**1=Pipe** (Inlet Controls 4.16 cfs @ 2.88 fps)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 2.61 cfs @ 0.90 fps)

Pond 11P: Infiltration basin



Pond 11P: Infiltration basin



Hydrograph for Pond 11P: Infiltration basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.00	0.00	0	1,275.00	0.00	0.00	0.00
5.50	0.00	0	1,275.00	0.00	0.00	0.00
6.00	0.00	0	1,275.00	0.00	0.00	0.00
6.50	0.00	0	1,275.00	0.00	0.00	0.00
7.00	0.01	7	1,275.01	0.00	0.00	0.00
7.50	0.02	29	1,275.03	0.00	0.00	0.00
8.00	0.03	70	1,275.07	0.00	0.00	0.00
8.50	0.05	136	1,275.13	0.00	0.00	0.00
9.00	0.08	243	1,275.20	0.00	0.00	0.00
9.50	0.10	397	1,275.30	0.01	0.01	0.00
10.00	0.14	597	1,275.40	0.01	0.01	0.00
10.50	0.21	893	1,275.53	0.01	0.01	0.00
11.00	0.33	1,355	1,275.71	0.01	0.01	0.00
11.50	0.62	2,160	1,275.95	0.01	0.01	0.00
12.00	**10.47**	**7,237**	**1,276.89**	**2.79**	**0.02**	**2.77**
12.50	**1.31**	**7,195**	**1,276.88**	**2.76**	**0.02**	**2.74**
13.00	0.72	5,295	1,276.60	1.38	0.02	1.37
13.50	0.54	4,476	1,276.46	0.84	0.02	0.83
14.00	0.42	4,062	1,276.38	0.60	0.02	0.58
14.50	0.37	3,815	1,276.33	0.47	0.01	0.45
15.00	0.33	3,673	1,276.30	0.39	0.01	0.38
15.50	0.29	3,571	1,276.28	0.35	0.01	0.33
16.00	0.26	3,483	1,276.26	0.31	0.01	0.29
16.50	0.24	3,406	1,276.25	0.27	0.01	0.26
17.00	0.22	3,353	1,276.24	0.25	0.01	0.24
17.50	0.21	3,312	1,276.23	0.23	0.01	0.22
18.00	0.20	3,275	1,276.22	0.22	0.01	0.20
18.50	0.19	3,239	1,276.21	0.20	0.01	0.19
19.00	0.17	3,204	1,276.21	0.19	0.01	0.18
19.50	0.16	3,170	1,276.20	0.18	0.01	0.17
20.00	0.15	3,134	1,276.19	0.17	0.01	0.15

Stage-Discharge for Pond 11P: Infiltration basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
1,275.00	0.00	0.00	0.00
1,275.05	0.00	0.00	0.00
1,275.10	0.00	0.00	0.00
1,275.15	0.00	0.00	0.00
1,275.20	0.00	0.00	0.00
1,275.25	0.00	0.00	0.00
1,275.30	0.01	0.01	0.00
1,275.35	0.01	0.01	0.00
1,275.40	0.01	0.01	0.00
1,275.45	0.01	0.01	0.00
1,275.50	0.01	0.01	0.00
1,275.55	0.01	0.01	0.00
1,275.60	0.01	0.01	0.00
1,275.65	0.01	0.01	0.00
1,275.70	0.01	0.01	0.00
1,275.75	0.01	0.01	0.00
1,275.80	0.01	0.01	0.00
1,275.85	0.01	0.01	0.00
1,275.90	0.01	0.01	0.00
1,275.95	0.01	0.01	0.00
1,276.00	0.01	0.01	0.00
1,276.05	0.02	0.01	0.01
1,276.10	0.06	0.01	0.04
1,276.15	0.11	0.01	0.10
1,276.20	0.18	0.01	0.17
1,276.25	0.27	0.01	0.26
1,276.30	0.38	0.01	0.37
1,276.35	0.51	0.01	0.50
1,276.40	0.66	0.02	0.64
1,276.45	0.82	0.02	0.80
1,276.50	1.00	0.02	0.98
1,276.55	1.19	0.02	1.17
1,276.60	1.39	0.02	1.37
1,276.65	1.61	0.02	1.59
1,276.70	1.84	0.02	1.82
1,276.75	2.08	0.02	2.06
1,276.80	2.32	0.02	2.30
1,276.85	2.58	0.02	2.56
1,276.90	2.84	0.02	2.82
1,276.95	3.11	0.02	3.09
1,277.00	3.39	0.02	3.36
1,277.05	4.19	0.02	4.17
1,277.10	5.44	0.02	5.42
1,277.15	6.98	0.02	6.96
1,277.20	8.74	0.02	8.72
1,277.25	10.80	0.02	10.78
1,277.30	13.10	0.03	13.07
1,277.35	15.61	0.03	15.58
1,277.40	18.34	0.03	18.31
1,277.45	21.25	0.03	21.22
1,277.50	24.34	0.03	24.31
1,277.55	27.68	0.03	27.65
1,277.60	31.23	0.03	31.20
1,277.65	34.57	0.03	34.54
1,277.70	38.03	0.03	38.00
1,277.75	41.59	0.03	41.56
1,277.80	45.27	0.03	45.24
1,277.85	49.04	0.03	49.01
1,277.90	52.91	0.03	52.88
1,277.95	56.88	0.03	56.85
1,278.00	**60.94**	**0.03**	**60.91**

Stage-Area-Storage for Pond 11P: Infiltration basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,275.00	898	0
1,275.05	1,043	49
1,275.10	1,187	104
1,275.15	1,332	167
1,275.20	1,477	237
1,275.25	1,621	315
1,275.30	1,766	400
1,275.35	1,911	491
1,275.40	2,055	591
1,275.45	2,200	697
1,275.50	2,345	811
1,275.55	2,489	931
1,275.60	2,634	1,060
1,275.65	2,778	1,195
1,275.70	2,923	1,337
1,275.75	3,068	1,487
1,275.80	3,212	1,644
1,275.85	3,357	1,808
1,275.90	3,502	1,980
1,275.95	3,646	2,159
1,276.00	3,791	2,345
1,276.05	3,982	2,539
1,276.10	4,173	2,743
1,276.15	4,365	2,956
1,276.20	4,556	3,179
1,276.25	4,747	3,412
1,276.30	4,938	3,654
1,276.35	5,130	3,906
1,276.40	5,321	4,167
1,276.45	5,512	4,438
1,276.50	5,703	4,718
1,276.55	5,894	5,008
1,276.60	6,086	5,308
1,276.65	6,277	5,617
1,276.70	6,468	5,935
1,276.75	6,659	6,263
1,276.80	6,851	6,601
1,276.85	7,042	6,948
1,276.90	7,233	7,305
1,276.95	7,424	7,672
1,277.00	7,616	8,048
1,277.05	7,807	8,433
1,277.10	7,998	8,828
1,277.15	8,189	9,233
1,277.20	8,380	9,647
1,277.25	8,572	10,071
1,277.30	8,763	10,505
1,277.35	8,954	10,947
1,277.40	9,145	11,400
1,277.45	9,337	11,862
1,277.50	9,528	12,334
1,277.55	9,719	12,815
1,277.60	9,910	13,305
1,277.65	10,101	13,806
1,277.70	10,293	14,316
1,277.75	10,484	14,835
1,277.80	10,675	15,364
1,277.85	10,866	15,903
1,277.90	11,058	16,451
1,277.95	11,249	17,008
1,278.00	**11,440**	**17,576**

Summary for Pond 13P: Wet Pond

Inflow Area =	5.950 ac,	0.00% Impervious,	Inflow Depth >	4.67"	for 100yr event
Inflow =	45.69 cfs @	11.99 hrs,	Volume=	2.314 af	
Outflow =	0.05 cfs @	20.00 hrs,	Volume=	0.025 af,	Atten= 100%, Lag= 480.3 min
Primary =	0.05 cfs @	20.00 hrs,	Volume=	0.025 af	
Secondary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,292.04' @ 20.00 hrs Surf.Area= 34,073 sf Storage= 99,690 cf

Plug-Flow detention time= 608.1 min calculated for 0.025 af (1% of inflow)
Center-of-Mass det. time= 239.4 min (1,001.4 - 762.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,288.50'	214,237 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

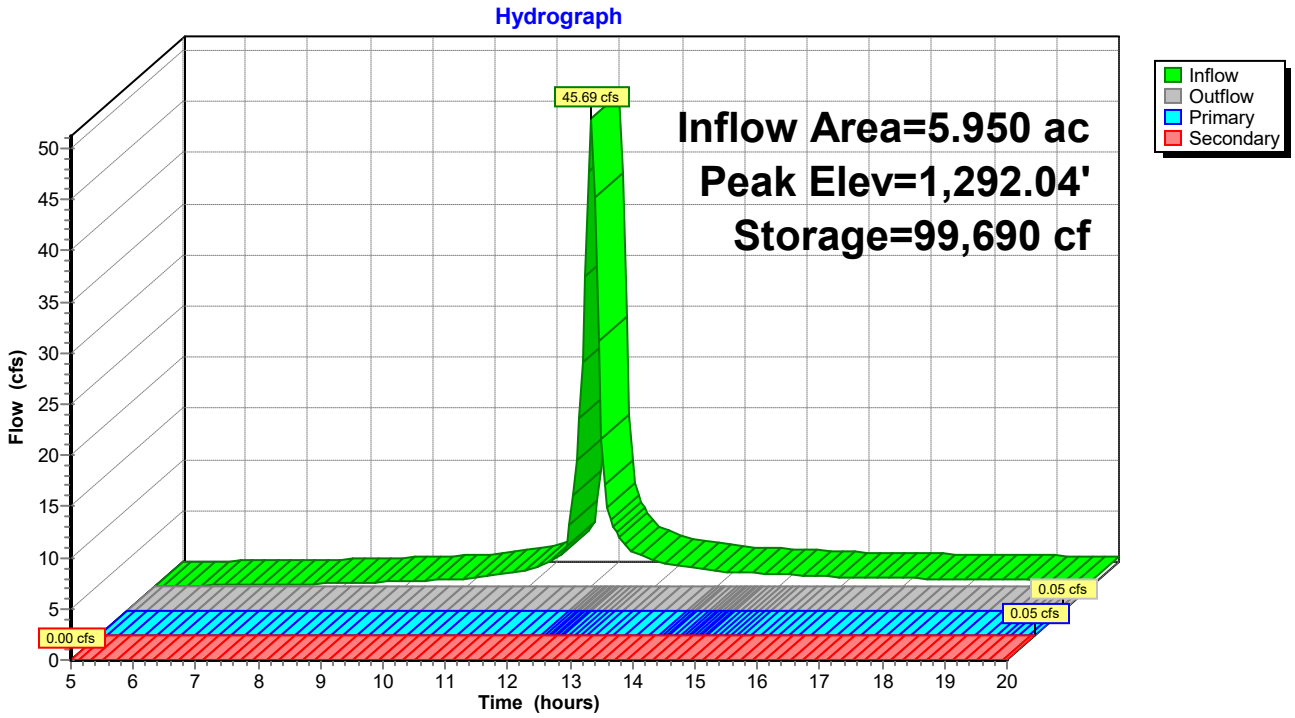
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,288.50	22,471	0	0
1,290.00	27,127	37,199	37,199
1,292.00	33,940	61,067	98,266
1,294.00	40,276	74,216	172,482
1,295.00	43,234	41,755	214,237

Device	Routing	Invert	Outlet Devices
#1	Primary	1,289.50'	**15.0" Round Pipe** L= 100.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,289.50' / 1,289.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,290.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,291.50'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1,292.00'	**1.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	1,293.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

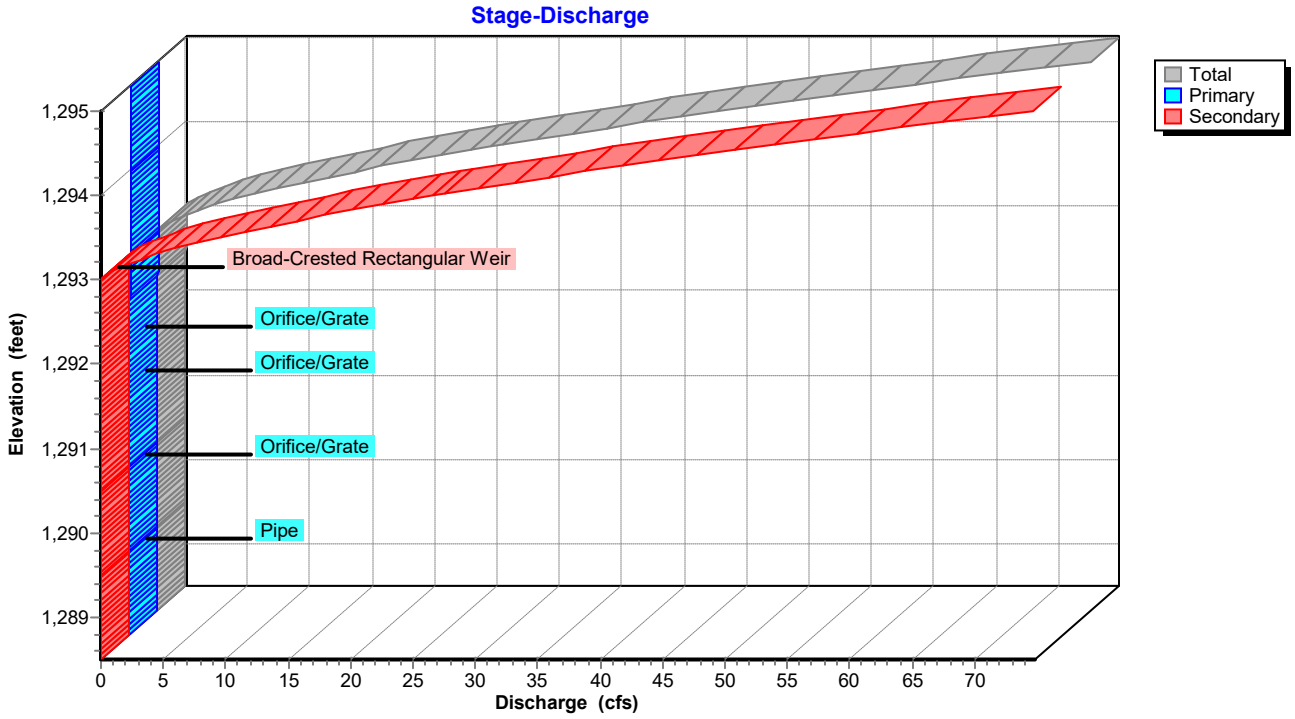
Primary OutFlow Max=0.05 cfs @ 20.00 hrs HW=1,292.04' (Free Discharge)
└─**1=Pipe** (Passes 0.05 cfs of 6.73 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.90 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.02 cfs @ 3.41 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.70 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=1,288.50' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 13P: Wet Pond



Pond 13P: Wet Pond



Hydrograph for Pond 13P: Wet Pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.00	0.02	2	1,288.50	0.00	0.00	**0.00**
5.50	0.06	78	1,288.50	0.00	0.00	0.00
6.00	0.10	225	1,288.51	0.00	0.00	0.00
6.50	0.15	449	1,288.52	0.00	0.00	0.00
7.00	0.19	755	1,288.53	0.00	0.00	0.00
7.50	0.24	1,147	1,288.55	0.00	0.00	0.00
8.00	0.29	1,628	1,288.57	0.00	0.00	0.00
8.50	0.39	2,234	1,288.60	0.00	0.00	0.00
9.00	0.53	3,061	1,288.63	0.00	0.00	0.00
9.50	0.61	4,104	1,288.68	0.00	0.00	0.00
10.00	0.80	5,344	1,288.73	0.00	0.00	0.00
10.50	1.12	7,052	1,288.81	0.00	0.00	0.00
11.00	1.68	9,536	1,288.91	0.00	0.00	0.00
11.50	2.99	13,589	1,289.08	0.00	0.00	0.00
12.00	**45.63**	43,822	1,290.24	0.00	0.00	0.00
12.50	4.38	69,261	1,291.11	0.02	0.02	0.00
13.00	2.56	74,955	1,291.29	0.02	0.02	0.00
13.50	1.92	78,879	1,291.41	0.02	0.02	0.00
14.00	1.51	81,900	1,291.51	0.03	0.03	0.00
14.50	1.31	84,350	1,291.58	0.03	0.03	0.00
15.00	1.18	86,536	1,291.65	0.04	0.04	0.00
15.50	1.05	88,480	1,291.71	0.04	0.04	0.00
16.00	0.92	90,181	1,291.76	0.04	0.04	0.00
16.50	0.85	91,682	1,291.80	0.04	0.04	0.00
17.00	0.80	93,090	1,291.85	0.04	0.04	0.00
17.50	0.75	94,410	1,291.89	0.05	0.05	0.00
18.00	0.71	95,642	1,291.92	0.05	0.05	0.00
18.50	0.66	96,787	1,291.96	0.05	0.05	0.00
19.00	0.61	97,844	1,291.99	0.05	0.05	0.00
19.50	0.56	98,813	1,292.02	0.05	0.05	0.00
20.00	0.52	**99,692**	**1,292.04**	**0.05**	**0.05**	0.00

Stage-Discharge for Pond 13P: Wet Pond

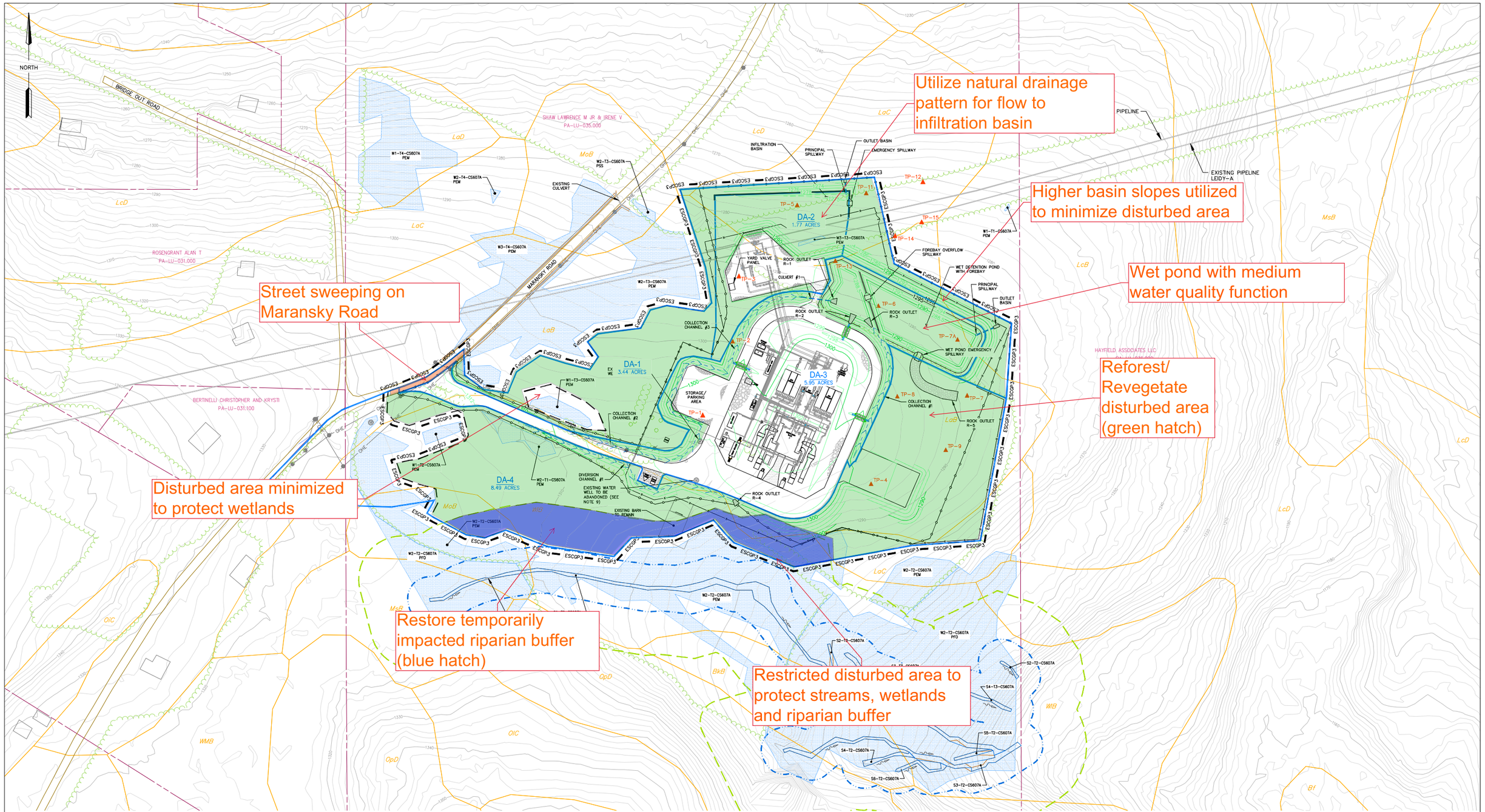
Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
1,288.50	0.00	0.00	0.00
1,288.60	0.00	0.00	0.00
1,288.70	0.00	0.00	0.00
1,288.80	0.00	0.00	0.00
1,288.90	0.00	0.00	0.00
1,289.00	0.00	0.00	0.00
1,289.10	0.00	0.00	0.00
1,289.20	0.00	0.00	0.00
1,289.30	0.00	0.00	0.00
1,289.40	0.00	0.00	0.00
1,289.50	0.00	0.00	0.00
1,289.60	0.00	0.00	0.00
1,289.70	0.00	0.00	0.00
1,289.80	0.00	0.00	0.00
1,289.90	0.00	0.00	0.00
1,290.00	0.00	0.00	0.00
1,290.10	0.00	0.00	0.00
1,290.20	0.00	0.00	0.00
1,290.30	0.00	0.00	0.00
1,290.40	0.00	0.00	0.00
1,290.50	0.00	0.00	0.00
1,290.60	0.01	0.01	0.00
1,290.70	0.01	0.01	0.00
1,290.80	0.01	0.01	0.00
1,290.90	0.02	0.02	0.00
1,291.00	0.02	0.02	0.00
1,291.10	0.02	0.02	0.00
1,291.20	0.02	0.02	0.00
1,291.30	0.02	0.02	0.00
1,291.40	0.02	0.02	0.00
1,291.50	0.03	0.03	0.00
1,291.60	0.03	0.03	0.00
1,291.70	0.04	0.04	0.00
1,291.80	0.04	0.04	0.00
1,291.90	0.05	0.05	0.00
1,292.00	0.05	0.05	0.00
1,292.10	0.06	0.06	0.00
1,292.20	0.07	0.07	0.00
1,292.30	0.07	0.07	0.00
1,292.40	0.08	0.08	0.00
1,292.50	0.08	0.08	0.00
1,292.60	0.08	0.08	0.00
1,292.70	0.09	0.09	0.00
1,292.80	0.09	0.09	0.00
1,292.90	0.10	0.10	0.00
1,293.00	0.10	0.10	0.00
1,293.10	0.91	0.10	0.81
1,293.20	2.40	0.10	2.30
1,293.30	4.37	0.11	4.26
1,293.40	6.74	0.11	6.63
1,293.50	9.52	0.11	9.40
1,293.60	12.66	0.12	12.55
1,293.70	15.84	0.12	15.73
1,293.80	19.23	0.12	19.10
1,293.90	22.88	0.12	22.75
1,294.00	26.73	0.13	26.60
1,294.10	30.88	0.13	30.75
1,294.20	35.23	0.13	35.10
1,294.30	39.64	0.13	39.50
1,294.40	44.20	0.14	44.06
1,294.50	48.82	0.14	48.68
1,294.60	53.57	0.14	53.43
1,294.70	58.66	0.14	58.52
1,294.80	63.90	0.15	63.75
1,294.90	69.29	0.15	69.14
1,295.00	**74.82**	**0.15**	**74.67**

Stage-Area-Storage for Pond 13P: Wet Pond

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,288.50	22,471	0
1,288.60	22,781	2,263
1,288.70	23,092	4,556
1,288.80	23,402	6,881
1,288.90	23,713	9,237
1,289.00	24,023	11,624
1,289.10	24,333	14,041
1,289.20	24,644	16,490
1,289.30	24,954	18,970
1,289.40	25,265	21,481
1,289.50	25,575	24,023
1,289.60	25,885	26,596
1,289.70	26,196	29,200
1,289.80	26,506	31,835
1,289.90	26,817	34,501
1,290.00	27,127	37,199
1,290.10	27,468	39,928
1,290.20	27,808	42,692
1,290.30	28,149	45,490
1,290.40	28,490	48,322
1,290.50	28,830	51,188
1,290.60	29,171	54,088
1,290.70	29,512	57,022
1,290.80	29,852	59,990
1,290.90	30,193	62,992
1,291.00	30,534	66,029
1,291.10	30,874	69,099
1,291.20	31,215	72,204
1,291.30	31,555	75,342
1,291.40	31,896	78,515
1,291.50	32,237	81,721
1,291.60	32,577	84,962
1,291.70	32,918	88,237
1,291.80	33,259	91,546
1,291.90	33,599	94,889
1,292.00	33,940	98,266
1,292.10	34,257	101,675
1,292.20	34,574	105,117
1,292.30	34,890	108,590
1,292.40	35,207	112,095
1,292.50	35,524	115,632
1,292.60	35,841	119,200
1,292.70	36,158	122,800
1,292.80	36,474	126,431
1,292.90	36,791	130,095
1,293.00	37,108	133,790
1,293.10	37,425	137,516
1,293.20	37,742	141,274
1,293.30	38,058	145,064
1,293.40	38,375	148,886
1,293.50	38,692	152,740
1,293.60	39,009	156,625
1,293.70	39,326	160,541
1,293.80	39,642	164,490
1,293.90	39,959	168,470
1,294.00	40,276	172,482
1,294.10	40,572	176,524
1,294.20	40,868	180,596
1,294.30	41,163	184,697
1,294.40	41,459	188,829
1,294.50	41,755	192,989
1,294.60	42,051	197,180
1,294.70	42,347	201,399
1,294.80	42,642	205,649
1,294.90	42,938	209,928
1,295.00	**43,234**	**214,237**

ATTACHMENT 5

NON-STRUCTURAL AND STRUCTURAL WATER QUALITY BMPS MAP



LEGEND

	PROPERTY LINES
ESCGP3	ESCGP-3 PERMIT BOUNDARY
	LIMITS OF DISTURBANCE
	COLLECTION CHANNEL
	DELINEATED WETLAND
	DELINEATED WATERWAY / STREAM (TOP OF BANK)
	STREAM FLOW DIRECTION
	RIPARIAN BUFFER
	50' FLOODWAY
FEMA	FEMA 100-YEAR FLOODPLAIN
	EXISTING LEIDY / TGPL PIPELINES
	EXISTING FOREIGN PIPELINES
	EXISTING PIPELINE RIGHT-OF-WAYS
	EXISTING UTILITY POLE / TOWER
	EXISTING UTILITY LINE
	EXISTING STRUCTURE
	EXISTING ROAD (GRAVEL)
	EXISTING ROAD (PAVED)
	EXISTING MINOR CONTOURS (2' C.I.)
780	EXISTING MAJOR CONTOURS (10' C.I.)
	PERMANENT FOOTPRINT
MrB2	SOIL BOUNDARY / TYPE
	EXISTING TREELINE / TREE/SHRUB
	PROPOSED MINOR CONTOUR (2' C.I.)
830	PROPOSED MAJOR CONTOUR (10' C.I.)
	PROPOSED CULVERT
	PROPOSED FENCE
	12" CRUSHED STONE (AASHTO #57)
	4"-6" CRUSHED STONE (AASHTO #57)
	GRASSED AREA
TP-C3	INFILTRATION TEST LOCATION
	POST-DEVELOPMENT DRAINAGE AREA

SOIL LEGEND

LaB	LACKAWANNA CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
LaC	LACKAWANNA CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES
LcB	LACKAWANNA CHANNERY SILT LOAM, 15 TO 25 PERCENT SLOPES
LcD	LACKAWANNA CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES, EXTREMELY STONY
MoB	MORRIS CHANNERY SILT LOAM, 0 TO 8 PERCENT SLOPES
WlB	WELLSBORO CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES

NOTES/SOURCES

1. EXISTING ROADWAYS, CONTOURS, PROPERTY LINE, TREE LINE, ETC. ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 AND JULY 2019.
2. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
3. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
4. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
5. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
6. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
7. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.
8. CONTRACTOR MAY ELECT TO USE DIVERSION CHANNEL OR IF CONDITIONS ALLOW WILL PLACE AN EARTHEN BERM OF APPROPRIATE SIZE THAT WILL CONVEY FLOW TO THE RESPECTIVE DESIGNATED CLEAN WATER CROSSING.

NOT TO SCALE

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER 041071-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN TO AVOID / MINIMIZED WETLAND IMPACTS AND PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

Williams.

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
PROPOSED CONDITIONS PLAN
FAIRMONT TOWNSHIP LUZERNE COUNTY PENNSYLVANIA

DRAWN BY: SWH	DATE: 7/29/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 3 OF 6
WO: 1211227	RID:		

ATTACHMENT 6
OFFSITE DISCHARGE REPORT

Transcontinental Gas Pipe Line Company, LLC

Offsite Discharge Report

Leidy South Project – Compressor Station 607

Wet Pond Outlet Structure
&
Infiltration Basin Outlet Structure

May 2020

1.0 Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc., is proposing the Leidy South Project (Project). Compressor Station 607 is proposed as part of the overall Project Compressor Station 607 will consist of installing two Solar Titan 130 gas driven turbine compressor units (23,465 nominal HP at International Organization for Standardization (ISO) conditions each, 46,930 HP total) and gas coolers. The new Compressor Station will require Erosion and Sediment (E&S) Control and Post Construction Stormwater Management (PCSM) Best Management Practices (BMP's) to manage stormwater runoff during and after construction.

Transco has developed an Offsite Discharge Report for the discharges associated with the proposed BMP's in response to technical deficiency comments issued by Pennsylvania Department of Environmental Protection (PaDEP) on April 3, 2020. An Offsite Discharge Report is performed to ensure that no offsite erosion will occur downstream of the proposed activities. The analysis conducted for this project followed the sequence outlined in PaDEP's factsheet for offsite discharges (Document #3930-FS-DEP4124).

2.0 Conveyance Best Management Practices

Erosion and Sediment Control and Post Construction Stormwater Management BMP's are proposed to manage stormwater runoff during and after construction. A sediment basin and wet pond and infiltration basin will be installed to convey the net increase in volume between the pre and post development 2-year storm events and mitigate the increase (pre-post development) in peak runoff for the 2-, 10-, 50-, and 100-year storm events. An outlet basin, which flows to an offsite area, is proposed as the discharge structure at these locations.

2.1 Sediment Basin / Wet Pond

The sediment basin/wet pond discharges and flows offsite into the adjacent forested area located southeast of the Limits of Disturbance. The stormwater is being discharged as sheet flow and travels along a vegetative flow path until it reaches Lick Branch. The flow path is depicted on Attachment A. Soil types and the erodibility factors within the flow path are shown on Table 1.

Table 1 – Soils Mapping within Flow Path	
Soil Mapping Unit	**Soil Erodibility Factor, K_f**
LaC	**K_f = 0.32**
LcD	**K_f = 0.32**
MsB	**K_f = 0.37**

The soil erodibility factors are shown in Table 1. A low K value indicates the soil will not easily erode whereas a high K value means the soil will easily erode. All of the soils in the flow path are considered moderately erodible (0.32 – 0.37). Photos were taken along the flow path of the downstream area to show the vegetative cover.

Photo 1 : Existing Area at Proposed Outlet Basin for Sediment Basin/Wet Pond

Photo 2 : Area Downgradient of the Proposed Outlet Basin for Sediment Basin/Wet Pond

Photo 1 shows the existing condition where the outlet basin for the Sediment Basin / Wet Pond is proposed. The area will be graded to facilitate the installation of the sediment basin/wet pond and revegetated. Photo 2 shows the areas downgradient of the proposed outlet basin, which is over 90% vegetated. In the E&S and PCSM Narrative, site calculations are provided that show the Pre- and Post-Construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed outlet basin are 0.86 feet per second for the for the 25 year, 24-hour storm event.

2.2 Infiltration Basin

The infiltration basin discharges and flows offsite into the adjacent forested area located northwest of the Limits of Disturbance. The stormwater is being discharged as

sheet flow and travels along a vegetative flow path until it reaches Lick Branch. The flow path is depicted on Attachment A. Soil types and the erodibility factors within the flow path are shown on Table 2.

Table 2 – Soils Mapping within Flow Path	
Soil Mapping Unit	**Soil Erodibility Factor, K_f**
LaB	**K_f = 0.32**
LaC	**K_f = 0.32**
LcD	**K_f = 0.32**
MsB	**K_f = 0.37**

The soil erodibility factors are shown in Table 1. A low K value indicates the soil will not easily erode whereas a high K value means the soil will easily erode. All of the soils in the flow path are considered moderately erodible (0.32 – 0.37). Photos were taken along the flow path of the downstream area to show the vegetative cover.

Photo 3 : Existing Area at Proposed Outlet Basin for Infiltration Basin

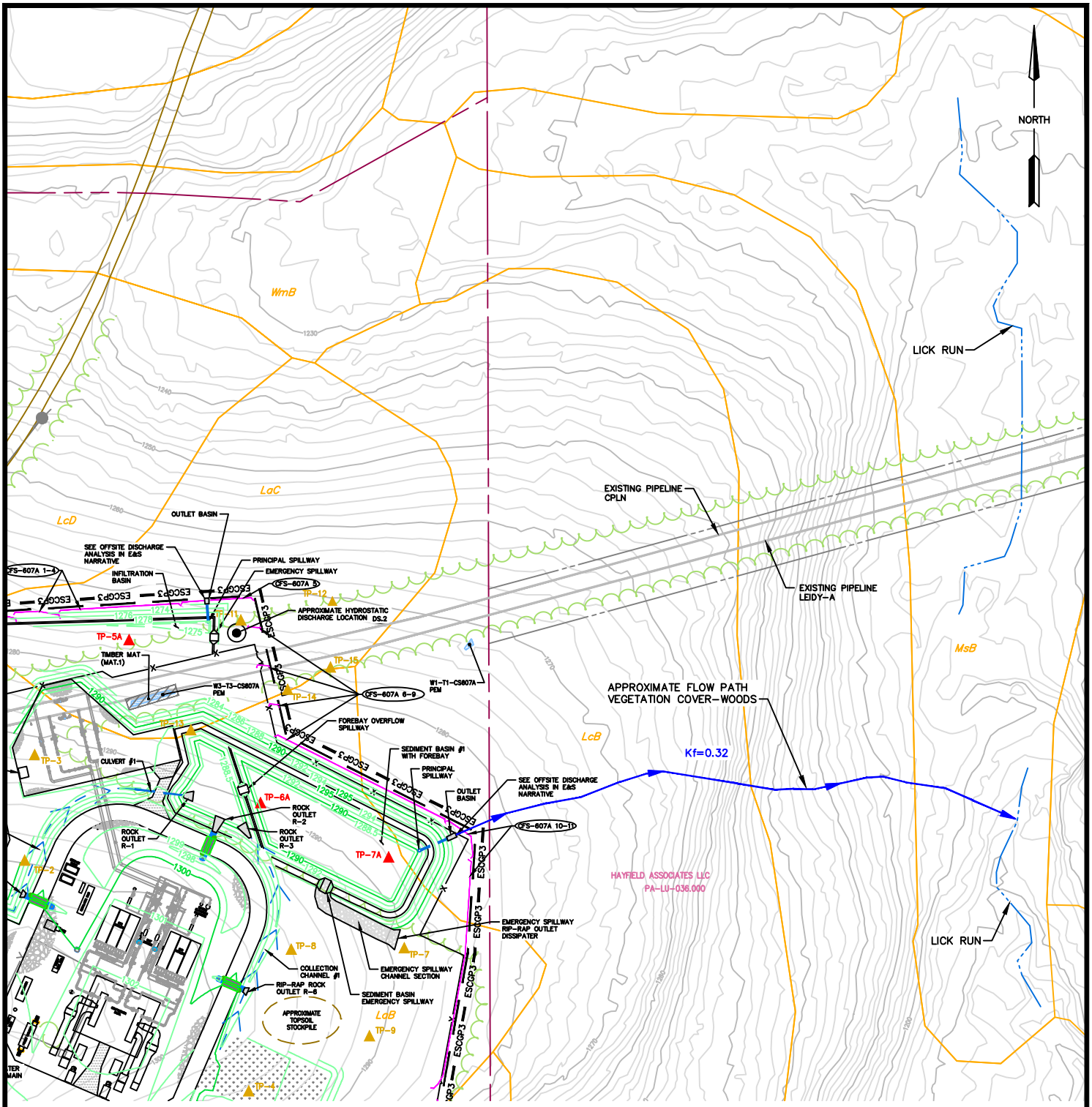
Photo 4 : Area Downgradient of the Proposed Outlet Basin for Infiltration Basin

Photo 3 shows the existing condition where the outlet basin for the infiltration basin is proposed. The area will be graded to facilitate the installation of the infiltration basin and revegetated. Photo 4 shows the areas downgradient of the proposed outlet basin for the infiltration basin, which is over 90% vegetated. In the E&S and PCSM Narrative, site calculations are provided that show the Pre- and Post-Construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed outlet basin are 2.47 feet per second for the for the 25 year, 24-hour storm event.

3.0 Conclusion

The Offsite Discharge Report completed for the proposed sediment basin/wet pond and infiltration basin indicated that the flow path downgradient of the outlet basin is not anticipated to erode during storm events due to the existing vegetative conditions, low discharge velocities, and soil erodibility values.

ATTACHMENT A
OUTLET FLOW PATH MAPS



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TELEPHONE: (814)-689-1650 FAX: (814)-689-1557

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607

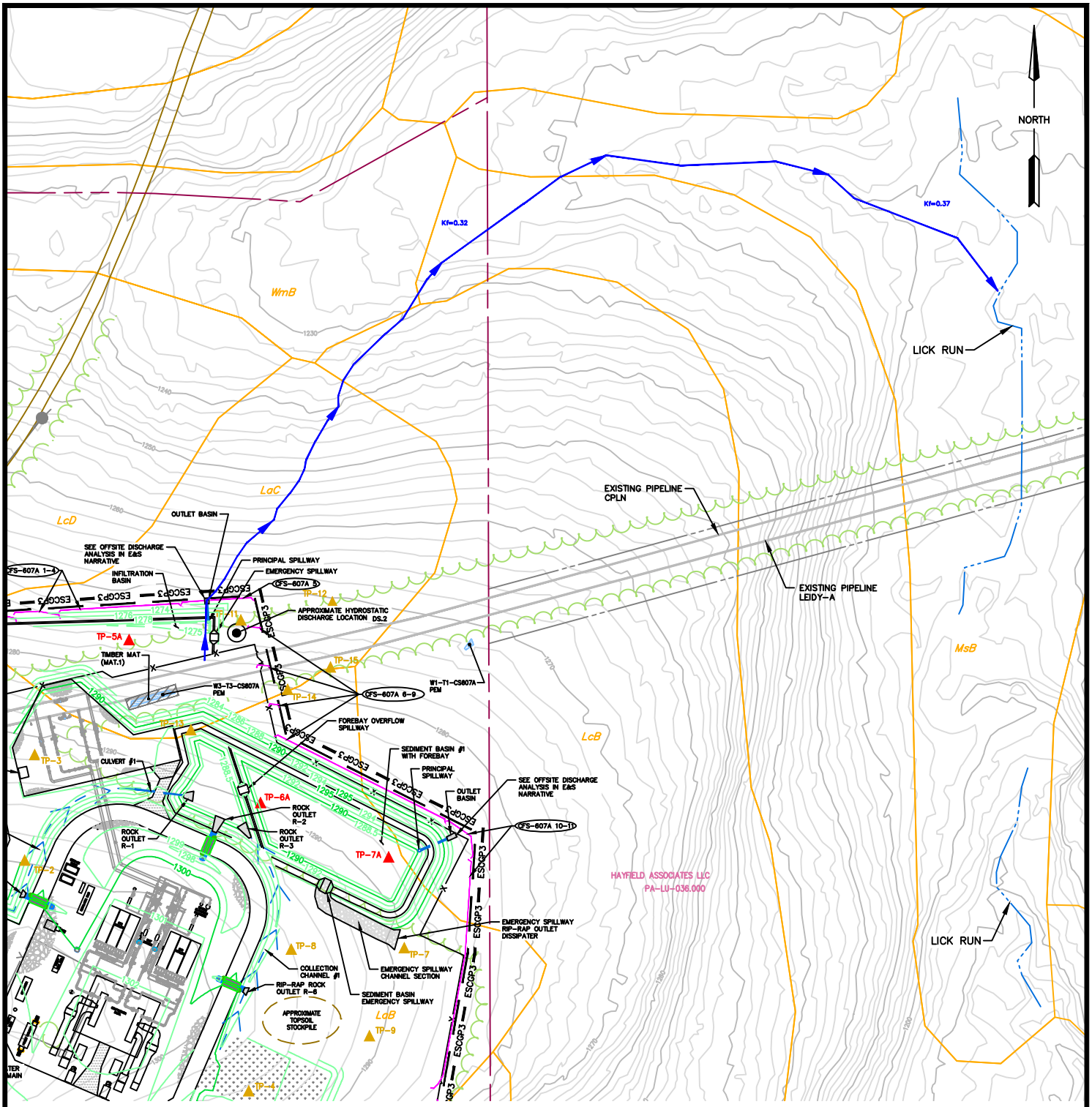
EROSION AND SEDIMENTATION CONTROL PLAN

FLOW PATH

FAIRMONT TOWNSHIP LUZERNE COUNTY PENNSYLVANIA

DATE:	05/11/20
DRAWN BY:	RHM
CHECKED:	KCC
WHM DRAWING NO:	BASIN 1 (FLOW PATH)

EXHIBIT 1.0



SCALE

200 100 0 200

SCALE 1" =200'

OFFSITE DISCHARGE FLOW PATH

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 607

EROSION AND SEDIMENTATION CONTROL PLAN

FLOW PATH

FAIRMONT TOWNSHIP LUZERNE COUNTY PENNSYLVANIA

DATE:	05/11/20
DRAWN BY:	RHM
CHECKED:	KCC
WHM DRAWING NO:	INF. BASIN (FLOW PATH)

EXHIBIT 1.0

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

LEIDY SOUTH PROJECT
COMPRESSOR STATION 620

HEGINS TOWNSHIP, SCHUYLKILL COUNTY, PENNSYLVANIA

SEPTEMBER 2019
(REVISED MAY, 2020)

PROJECT OWNER/APPLICANT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
PARK PLACE CORPORATE CENTER TWO,
2800 POST OAK BLVD
HOUSTON, TX 77056
PH: 713.215.3427
CONTACT: JOSEPH DEAN, ENVIRONMENTAL MANAGER

PLAN PREPARER / ENGINEER

WHM CONSULTING, INC
2525 GREEN TECH DRIVE, SUITE B
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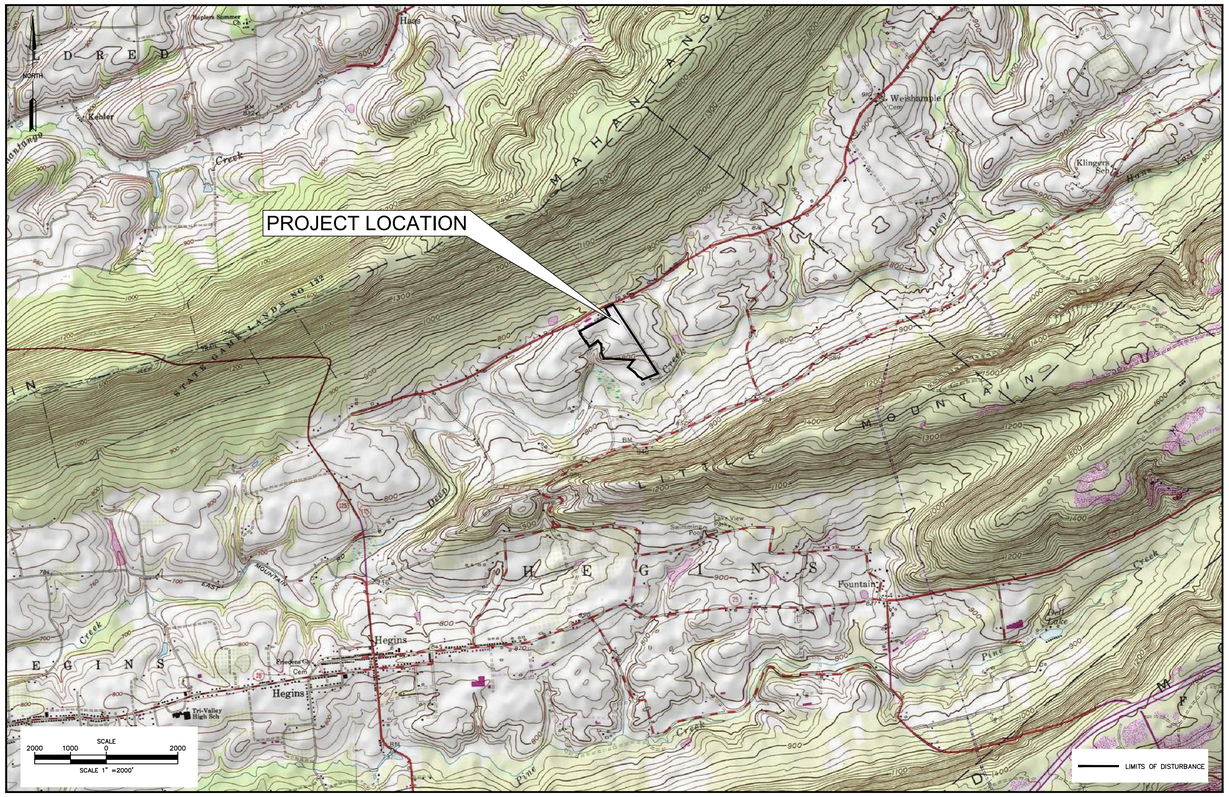
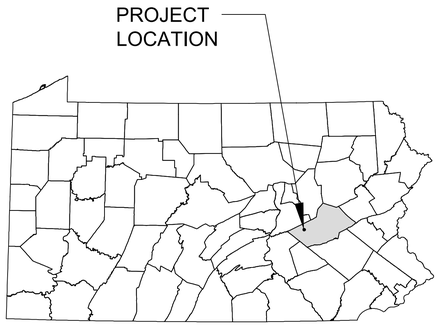
CONTACT: KEVIN M. CLARK, PROJECT MANAGER

BAI GROUP, LLC
2525 GREEN TECH DRIVE, SUITE D
STATE COLLEGE, PA 16803
PH: (814) 238-2060
CONTACT: KEVIN C. CLARK, P.E.



LOCATION MAP



VICINITY MAP
N.T.S.

SHEET INDEX	
SHEET NUMBER	DRAWING TITLE
1 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - COVER SHEET
2 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - EXISTING CONDITIONS PLAN
3 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - PROPOSED CONDITIONS PLAN
4 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - NOTES
5 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - DETAIL SHEET 1
6 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - DETAIL SHEET 2
7 OF 7	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN - DETAIL SHEET 3

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REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047271
PENNSYLVANIA PROFESSIONAL ENGINEER

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 620
Williams.

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
COVER SHEET
HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

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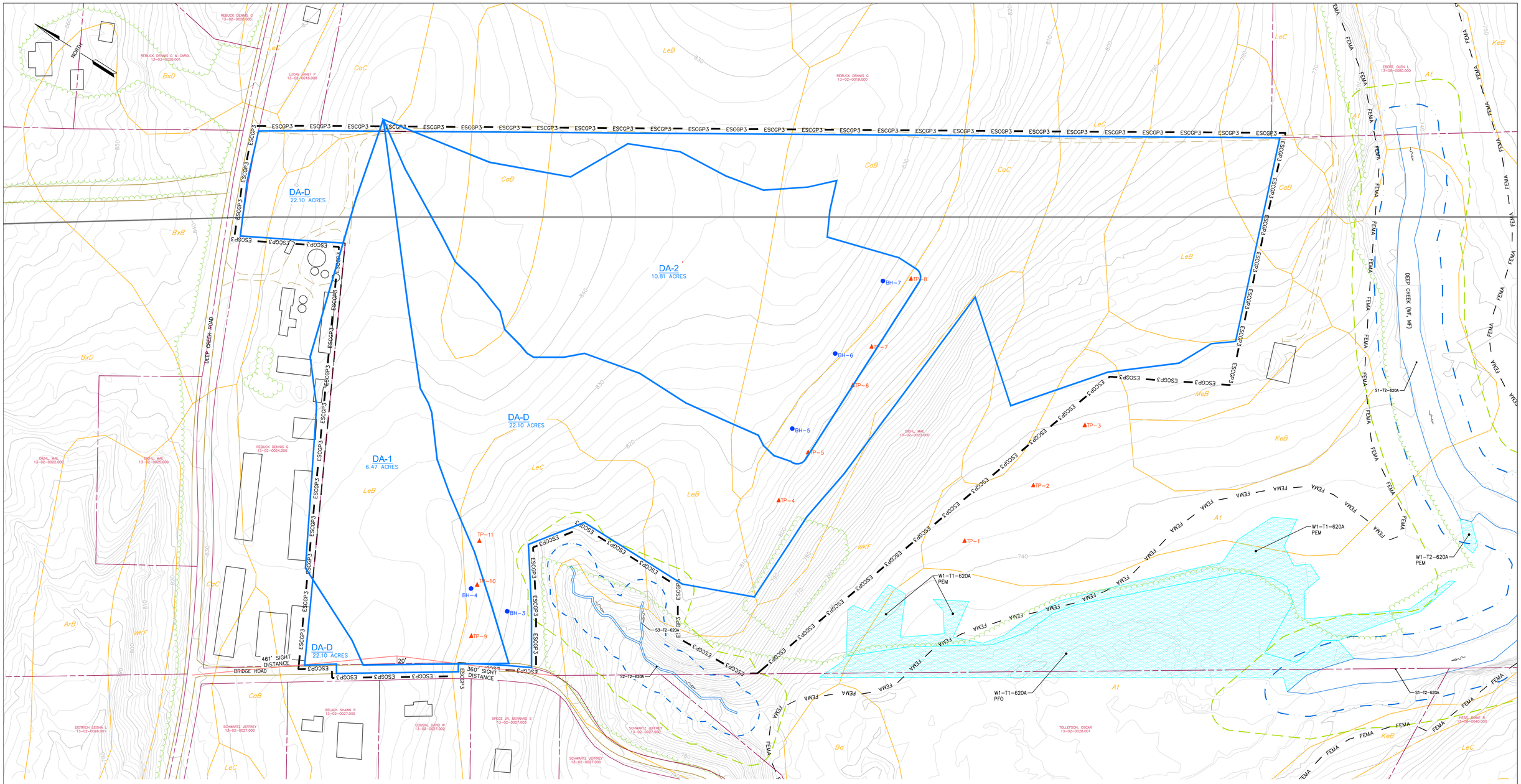
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 1 OF 7
WO: 121227	RID:		



LEGEND

- PROPERTY LINE
- EXISTING MINOR CONTOURS (2' C.I.)
- 1200 EXISTING MAJOR CONTOURS (10' C.I.)
- ESCGP3 ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50' FLOODWAY
- FEMA FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- TP-C3 SOIL TEST PIT LOCATION
- BH-7 BORE HOLE TEST LOCATION
- PRE-DEVELOPMENT DRAINAGE AREA

SOIL LEGEND

Ba	BASHER SILT LOAM
CaB	CAVIN SHALY SILT LOAM, 3 TO 8 PERCENT SLOPES
CaC	CALVIN SHALY SILT LOAM, 8 TO 15 PERCENT SLOPES
LeB	LECK KILL CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
LeC	LECK KILL CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES
MeB	MECKESVILLE LOAM, 3 TO 8 PERCENT SLOPES
WKF	WEIKERT AND KLINESVILLE SHALY SILT LOAMS, STEEP

EXISTING CONDITION NOTES/SOURCES

1. EXISTING ROADWAYS, CONTOURS, PROPERTY LINE, TREE LINE, ETC. ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 AND JULY 2019.
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3. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
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GENERAL NOTE

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SCALE
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SCALE 1" =100'

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KEVIN C. CLARK
ENGINEER
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LEIDY SOUTH PROJECT - COMPRESSOR STATION 620
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
EXISTING CONDITIONS PLAN

HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

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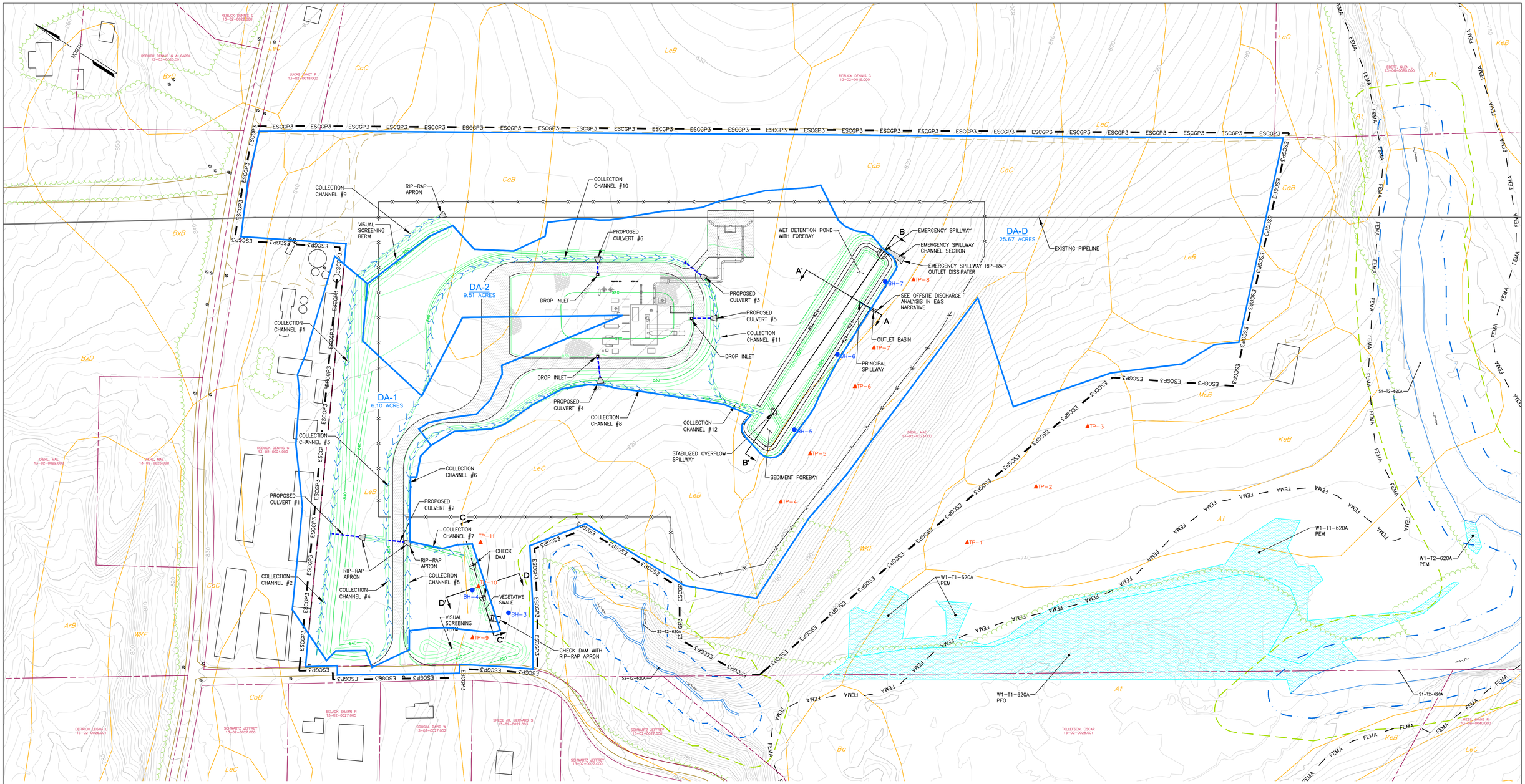
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 2 OF 7
WO: 1211227	RID:		



LEGEND

- PROPERTY LINES
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
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- FEMA 100-YEAR FLOODPLAIN
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- BH-7 — BORE HOLE TEST LOCATION
- POST-DEVELOPMENT DRAINAGE AREA
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LEIDY SOUTH PROJECT - COMPRESSOR STATION 620
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

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PROPOSED CONDITIONS PLAN

HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

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CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 3 OF 7
WO: 1211227	RID:		

RESOLUTION TO SOIL LIMITATIONS

TRANSCO PROPOSES THE FOLLOWING RESOLUTIONS TO COMPENSATE FOR SOIL LIMITATIONS SUMMARIZED IN TABLE 3 ABOVE:

1. TO OFFSET THE CAVING OF CUTBANKS, TRENCHING OPERATIONS WILL BE CONDUCTED IN ACCORDANCE WITH THE OSHA TECHNICAL MANUAL FOR TRENCHING.
2. PREVENTATIVE COATINGS SHALL BE USED TO PREVENT CORROSION OF CONCRETE AND/ OR STEEL.
3. WHEN BEDROCK IS ENCOUNTERED IT WILL BE REMOVED BY MECHANICAL METHODS OR BLASTING. BLASTING WILL CONFORM WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS. THIS IS NOT ANTICIPATED.
4. PRECAUTIONS WILL BE TAKEN TO PREVENT SLOPE FAILURE WHEN WORKING WITHIN LOW STRENGTH SOILS BY FLATTENING CUT / FILL SLOPES, NOT OVERLOADING, MAINTAINING LATERAL SUPPORT, AND PREVENTING SATURATION OF SOILS. USE OF THESE SOILS WILL BE AVOIDED FOR ROADWAY CONSTRUCTION.
5. FOR SOILS PRONE TO FLOODING, SLOW PERCOLATION, PONDING WETNESS, HAVE A SEASONAL HIGH WATER TABLE, OR ARE HYDRIC, EXCAVATIONS IN SOILS THAT HAVE THESE CHARACTERISTICS WILL LIKELY ENCOUNTER WATER, DEWATER WITH APPROPRIATE MEANS SUCH AS PUMP WATER FILTER BAGS, SEDIMENT TRAPS, ETC.
6. SOILS THAT HAVE THE POTENTIAL TO SWELL, SHRINK, OR HEAVE DUE TO FROST ACTION MAY CAUSE DAMAGE TO ROADWAYS OR PADS WHERE FOUNDATIONS ARE CRITICAL REMOVAL AND REPLACEMENT OF SOILS WITH SUITABLE MATERIAL MAY BE REQUIRED.
7. IN SOILS THAT ARE A POOR SOURCE OF TOPSOIL, DROUGHTY OR PRONE TO WETNESS, SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL, WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.
8. FOR THOSE SOILS THAT ARE EASILY ERODIBLE, PROVIDE PROTECTIVE LINING, SEEDING AND MULCHING, EROSION CONTROL BLANKETS (ROLLS OR HYDRAULICALLY APPLIED), TRACKING SLOPES, UPSTREAM DIVERSIONS, WATERBARS, ETC., TO MINIMIZE EROSION OF THE SOILS.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME		CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Basher	Ba	X	C/S			X	X	X	X	X	X	X	X				x
Calvin	CaB, CaC	X	C	X	X			X			X		X				
Leck Kill	LeB, LeC	X	C						X	X	X	X	X				x
Meckesvil	MeB	X	C/S				X		X	X	X	X	X				x
Weikert	WKF	X	C/S	X				X	X	X	X	X	X				

CHARACTERISTICS OF EARTH DISTURBANCE ACTIVITY, INCLUDING PAST, PRESENT AND PROPOSED LAND USE PROPOSED ALTERATIONS TO THE AREA

THE LIMIT OF DISTURBANCE WILL BE APPROXIMATELY 45.3 ACRES. USING DATA TAKEN FROM GOOGLE EARTH AND MULTI–RESOLUTION LAND CHARACTERISTICS (MRLC) CONSORTIUM WEBSITE (HTTPS://WWW.MRLC.GOV/VIEWER/), LAND USE FOR THE PAST 20 YEARS HAS BEEN CULTIVATED CROPLAND. BASED ON THE SURROUNDING LAND CHARACTERISTICS, LAND USE WITHIN THE PAST 50 YEARS WOULD HAVE BEEN FORESTED LAND, CROPLAND OR MEADOW. THE COMPRESSOR STATION 620 WILL HAVE ONE GAS TURBINE–DRIVEN COMPRESSOR UNIT. THE CONSTRUCTION OF ACCESS ROAD AND COMPRESSOR STATION FACILITIES WILL INCREASE THE VOLUME OF STORMWATER RUNOFF DUE TO THE INCREASE IN THE TYPE AND SIZE OF THE IMPERVIOUS AREA. THE CONTRACTOR WILL USE STORMWATER BMPS TO MITIGATE THE INCREASE IN VOLUME AND PEAK RATES ASSOCIATED WITH CONSTRUCTION. THE PROPOSED BMPS ARE DESIGNED TO EVAPORATE AND INFILTRATE THE NET INCREASE IN VOLUME BETWEEN THE PRE– AND POST–DEVELOPMENT 2 YEAR RAIN EVENTS. REFER TO THE STORMWATER BMP SIZING CALCULATIONS IN ATTACHMENT 4 FOR ADDITIONAL INFORMATION.

BMP DESCRIPTION NARRATIVE

CONVEYANCE BMPS AND A SEDIMENT BASIN, WILL BE INSTALLED ACROSS THE DEVELOPED AREA TO CONVEY THE NET INCREASE IN VOLUME BETWEEN THE PRE AND POST DEVELOPMENT 2–YEAR STORM EVENTS AND MITIGATE THE INCREASE (PRE–POST DEVELOPMENT) IN PEAK RUNOFF FOR THE 2–, 10–, 50–, AND 100–YEAR STORM EVENTS. SEDIMENT BASIN USED AT THE SITE FOR E&S CONTROL WILL BE DEWATERED AND SUBSEQUENTLY REGRADED AS A WET DETENTION POND. IN ADDITION, A VEGETATED SWALE WILL BE CONSTRUCTED TO INFILTRATE RUNOFF FROM THE PROPOSED ACCESS ROAD. A SUMMARY OF THE PROPOSED BMPS IS INCLUDED BELOW:

- DIVERSION CHANNELS WILL BE CONSTRUCTED TO DIRECT A MAJORITY OF THE RUNOFF FROM THE DEVELOPED AREA TO THE WET POND AND VEGETATED SWALE
- SWALE WILL BE 3FT DEEP WITH 5:1 SIDE SLOPE AND 8 FT BOTTOM WIDTH. THE 6 FT DEEP WET POND WILL HAVE AN INSIDE SLOPE OF 2:1 AND OUTSIDE SLOPE OF 3:1. A FOREBAY WILL BE PROVIDED TO TRAP SEDIMENTS FROM RUNOFF. WET POND WILL HAVE A PRIMARY OUTLET DEVICE WITH OUTLET BASIN THAT WILL DISCHARGE RUNOFF AS SHEET FLOW AND AN EMERGENCY SPILLWAY FOR STORMS GREATER THAN 100–YR STORM.

BMP INSTALLATION SEQUENCE

The PCSM BMPs SHOULD BE INSTALLED IN A MANNER DESIGNED TO:

1. PROTECT BMP AREAS ASSOCIATED WITH INFILTRATION FROM COMPACTION PRIOR TO AND DURING INSTALLATION.
2. MAINTAIN PROPER EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION.
3. VEGETATED SWALE
   a. CONSTRUCT AND STABILIZE THE SWALE EARLY IN THE CONSTRUCTION SCHEDULE, PREFERABLY BEFORE MASS EARTHWORK AND PAVING INCREASE THE RATE AND VOLUME OF RUNOFF.
   b. ROUGH GRADE THE VEGETATED SWALE. AVOID EXCESSIVE COMPACTION AND/OR LAND DISTURBANCE.
   c. AS NEEDED, REMOVE UNSUITABLE SOIL (CLAYEY, ROCKY, COARSE SANDS, ETC.) TO SUPPORT DENSE VEGETATION, REPLACING WITH APPROXIMATELY 12 INCHES OF LOAMY OR SANDY SOILS. ALKALINE SOILS ARE RECOMMENDED TO FURTHER REDUCE AND RETAIN METALS.
   d. INSTALL OUTLET CONTROL STRUCTURE.
   e. FINAL GRADE THE SWALE TO ENSURE ACCURACY.
   f. SEED AND STABILIZE AS SOON AS POSSIBLE.
   i. SELECT DENSE AND DIVERSE CLOSE–GROWING, WATER–RESISTANT PLANTS WHOSE GROWING SEASON CORRESPONDS TO THE WET SEASON.
   ii. VEGETATION SHOULD BE SELECTED AT AN EARLY STAGE IN THE DESIGN PROCESS, WITH WELL–DEFINED POLLUTION CONTROL GOALS IN MIND.
   iii. SELECTED VEGETATION MUST BE ABLE TO THRIVE AT THE SPECIFIC SITE AND THE USE OF NATIVE PLANT SPECIES IS STRONGLY ADVISED, AS IS THE AVOIDANCE OF INVASIVE PLANT SPECIES.
   iv. SWALE VEGETATION MUST ALSO BE SALT TOLERANT, AS THE PAVED ROADWAY WILL UNDERGO WINTER ROAD MAINTENANCE ACTIVITIES THAT WILL CONTRIBUTE TO SALT/CHLORIDES.
   v. THE SWALE IS PARTICULARLY VULNERABLE TO SCOUR AND EROSION PRIOR TO THE ESTABLISHMENT OF VEGETATION. PROTECT THE SEED BED WITH TEMPORARY EROSION CONTROL, SUCH AS STRAW MATTING, COMPOST BLANKETS, OR CURLED WOOD BLANKETS.
4. WET DETENTION POND WITH FOREBAY
   a. DEWATER THE SEDIMENT BASIN AND FLUSH OUT THE OUTLET PIPE AND OUTLET BASIN TO CLEAN EXCESS ACCUMULATED SEDIMENT.
   b. REMOVE ANY TEMPORARY RISERS FROM THE BASIN AND INSTALL PERMANENT RISERS
   c. MAKE ANY NECESSARY REPAIRS TO THE BASIN BOTTOM AND INSIDE SLOPES. THIS INCLUDES REPAIRS TO THE 12□ COMPACTED SOIL SUBBASE AND/OR 12□ TOPSOIL COVER.
   d. REMOVE EXISTING VEGETATION FROM THE BASIN BOTTOM. APPLY EROSION CONTROL MEASURES AS NECESSARY.
   e. AS AREAS ARE COMPLETED, SEED, PLANT AND MULCH IN ACCORDANCE WITH THE SECTION BELOW.
   f. INSTALL ANTI–GRAZING MEASURES, IF NECESSARY
   g. WET POND BOTTOM SHALL BE REVEGETATED WITH ERNST SEEDS ERNMX–128, SEASONALLY FLOODED WILDLIFE FOOD MIX, OR APPROVED EQUAL. WHERE NECESSARY, RESEED AND MULCH INTERIOR SIDE SLOPES WITH SAME SEED MIX UTILIZED FOR REVEGETATING THE SEDIMENTATION BASIN.
5. SELECT PLANTS THAT ARE WELL ADAPTED TO THE SPECIFIC SITE CONDITIONS. MEADOW PLANTS MUST BE ABLE TO OUT COMPETE WEED SPECIES IN THE FIRST FEW YEARS AS THEY BECOME ESTABLISHED.
6. ALL TEMPORARY E&S BMPS WILL BE REMOVED FOLLOWING SITE STABILIZATION. DO NOT REMOVE OTHER EROSION AND SEDIMENT CONTROL MEASURES UNTIL SITE IS FULLY STABILIZED.
7. ALL INSTALLED BMPS WILL BE MONITORED UNTIL FINAL SITE STABILIZATION IS ACHIEVED.
8. FOLLOW LONG TERM OPERATION AND MAINTENANCE GUIDELINES DISCUSSED BELOW.

SEEDING AND MULCHING:

THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER CONSTRUCTION IS COMPLETED. ESTABLISHMENT OF TEMPORARY COVER MUST TAKE PLACE WITHIN 4 DAYS OF CESSATION OF WORK. TEMPORARY EROSION AND SEDIMENTATION CONTROL BMPS CAN BE REMOVED WHEN THE SITE MEETS FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL–DISTURBING ACTIVITIES ARE COMPLETED, AND THAT A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT HARD COVER SUCH AS PAVEMENT OR BUILDINGS HAS STABILIZED THE SURFACE. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE. NO HAY OR STRAW MULCH SHALL BE PLACED ON WATERBODY BANKS. AT A MINIMUM, ALL WATERBODY BANKS SHALL BE COVERED WITH EROSION CONTROL BLANKET. IN ADDITION, ONLY STRAW MULCH SHALL BE USED IN AREAS ADJACENT TO WETLANDS.

TEMPORARY REVEGETATION

AFTER GRADING AND EXCAVATION IS COMPLETED WITHIN AN AREA, VEGETATION WILL BE SOWN PROMPTLY AFTER CEASING EARTHWORK IN THOSE AREAS. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL WILL BE APPLIED TO NEWLY SEEDED AREAS TO PROTECT AGAINST EROSION UNTIL THE VEGETATION IS ESTABLISHED. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL SHALL BE APPLIED AT A RATE OF AT LEAST 3 TONS PER ACRE. EROSION CONTROL BLANKET SHALL BE USED ON STREAM BANKS. NO HAY OR STRAW, MULCH OR BLANKET SHALL BE UTILIZED IN WETLAND AREAS.

PERMANENT SEEDING AND MULCHING

TOPSOIL WILL BE REPLACED PRIOR TO STABILIZATION. DISTURBED AREAS SHALL BE SEEDED WITH A MIXTURE AS OUTLINED IN THE DETAILS PAGES OF THE EROSION AND SEDIMENT CONTROL PLAN SET. APPLY LIME AND FERTILIZER IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS OR AS OUTLINED IN THE BELOW TABLE. HAY, STRAW MULCH, OR OTHER SIMILAR MATERIAL SHALL BE APPLIED AT A RATE OF AT LEAST 3 TONS PER ACRE.

TABLE 11.2
Soil Amendment Application Rate Equivalents

Soil Amendment	Permanent Seeding Application Rate: Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	Notes
Agricultural lime	6 tons	240 lb.	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-20-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields
	Temporary Seeding Application Rate			
Agricultural lime	1 ton	40 lb.	410 lb.	Typically not required for topsoil stockpiles
10-10-10 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for topsoil stockpiles

Adapted from Penn State, "Erosion Control and Conservation Plantings on Noncropland"

NOTE: A compost blanket which meets the standards of this chapter may be substituted for the

TABLE 11.3
Plant Tolerances of Soil Limitation Factors

Species	Growth Habit[1]	Tolerates: Wet Soil	Dry Site	Low Fertility	Acid Soil (pH 5-5.5)[2]	Minimum Seed Specifications[3]: Purity (%)	Ready Germ (%)	Hard Seed (%)	Total Germ (%)	Seeds/lb (1,000s)
Warm-Season Grasses										
Deertongue	bunch	yes	yes	yes	yes	95	75		75	250
Weeping lovegrass	bunch	no	yes	yes	yes	97	75		75	1,500
Switchgrass[4]	bunch	yes	yes	yes	yes	(60 PLS)				390
Big bluestem	bunch	no	yes	yes	yes	(60 PLS)				150
Cool-Season Grasses										
Tall Fescue	bunch	yes	no	yes	no	95	80		80	227
Redtop	sod	yes	yes	yes	yes	92	80		80	5,000
Fine fescues	sod	no	no	yes	no	95	80		80	400
Perennial ryegrass	bunch	yes	no	no	no	95	85		85	227
Annual ryegrass	bunch	yes	no	yes	no	95	85		85	227
Kentucky bluegrass	sod	no	no	no	no	85	75		75	2,200
Reed canarygrass	sod	yes	yes	yes	no	95	70		70	520
Orchardgrass	bunch	yes	yes	yes	yes	95	80		80	654
Timothy	bunch	yes	no	yes	yes	95	80		80	1,230
Smooth bromegrass	sod	no	yes	yes	no	95	80		80	136
Legumes[5]										
Crownvetch	sod	no	yes	yes	no	98	40	30	65	120
Birdsfoot trefoil[6]	bunch	yes	no	yes	yes	98	60	20	80	400
Flatpea	sod	no	no	yes	yes	98	55	20	75	10
Serecia lespedeza	bunch	no	yes	yes	yes	98	60	20	80	335
Cereals										
Winter wheat	bunch	no	no	no	no	98	85		85	15
Winter rye	bunch	no	no	yes	yes	98	85		85	18
Spring oats	bunch	no	no	no	no	98	85		85	13
Sundangrass	bunch	no	yes	no	no	98	85		85	55
Japanese millet	bunch	yes	no	yes	yes	98	80		80	155

[1] Growth habit refers to the ability of the species to either form a dense sod by vegetative means (stolons, rhizomes, or roots) or remain in a bunch or single plant form. If seeded heavily enough, even bunch formers can produce a very dense stand. This is sometimes called a sod, but not in the sense of a sod formed by vegetative means.

[2] Once established, plants may grow at a somewhat lower pH, but cover generally is only adequate at pH 6.0 or above.

[3] *Minimum seed lots are truly minimum, and seed lots to be used for revegetation purposes should equal or exceed these standards.* Thus, deertongue grass should germinate 75% or better. Crownvetch should have at least 40% readily germinable seed and 30% hard seed. Commonly, seed lots are available that equal or exceed minimum specifications. Remember that disturbed sites are adverse for plant establishment. Ready germination refers to seed that germinates during the period of the germination test and that would be expected, if conditions are favorable, to germinate rapidly when planted. The opposite of ready germination is dormant seed, of which hard seed is one type.

[4] Switchgrass seed is sold only on the basis of PLS.

[5] Need specific legume inoculant. Inoculant suitable for garden peas and sweetpeas usually is satisfactory for flatpea.

[6] Birdsfoot trefoil is adapted over the entire state, except in the extreme southeast where crown and root rots may injure stands.

Penn State, "Erosion Control and Conservation Plantings on Noncropland,"

TABLE 11.4
Recommended Seed Mixtures

Mixture Number	Species	Seeding Rate - Pure Live Seed[1]: Most Sites	Adverse Sites
1[2]	Spring oats (spring), or Annual ryegrass (spring or fall), or Winter wheat (fall), or Winter rye (fall)	64 10 90 56	96 15 120 112
2[3]	Tall fescue, or Fine fescue, or Kentucky bluegrass, plus Redtop[4], or Perennial ryegrass	60 35 25 3 15	75 40 30 3 20
3	Birdsfoot trefoil, plus Tall fescue	6 30	10 35
4	Birdsfoot trefoil, plus Reed canarygrass	6 10	10 15
8	Flatpea, plus Tall fescue, or Perennial ryegrass	20 20 20	30 30 25
9[6]	Serecia lespedeza, plus Tall fescue, plus Redtop[4]	10 20 3	20 25 3
10	Tall fescue, plus Fine fescue	40 10	60 15
11	Deertongue, plus Birdsfoot trefoil	15 6	20 10
12[7]	Switchgrass, or Big Bluestem, plus Birdsfoot trefoil	15 15 6	20 20 10
13	Orchardgrass, or Smooth bromegrass, plus Birdsfoot trefoil	20 25 6	30 35 10

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. PLS is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds PLS shown on the seed tag. Thus, if the PLS content of a given seed lot is 35%, divide 12 PLS by 0.35 to obtain 34.3 pounds of seed required to plant one acre. All mixtures in this table are shown in terms of PLS.
2. If high-quality seed is used, for most sites seed spring oats at a rate of 2 bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at 1 bushel per acre. If germination is below 90%, increase these suggested seeding rates by 0.5 bushel per acre.
3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.
4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.
5. Use for highway slopes and similar sites where the desired species after establishment is crownvetch.

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PCSM CRITICAL STAGES

A SCHEDULE OF VISITS FOR THE LICENSED PROFESSIONAL OR DELEGATE IS PROVIDED BELOW. CRITICAL POINTS WHICH WILL REQUIRE VISITS AT A MINIMUM ARE LISTED AS FOLLOWS:

1. FOR THE FINAL GRADING AND SEEDING OF THE WET POND, ENSURING IT IS CONSTRUCTED ACCORDING TO THE PLAN DETAILS FOR PROPER COLLECTION, INFILTRATION, AND CONVEYANCE OF RUNOFF. ACCUMULATED SEDIMENT SHOULD BE CLEANED OUT SO THE BASIN HAS THE NECESSARY DESIGN VOLUME.
2. FOR THE LAYOUT AND EXCAVATION OF THE OUTLET PIPE, THE PROFESSIONAL OR DELEGATE WILL ENSURE SIZING, MATERIALS SPECIFICATIONS, AND CONSTRUCTION PROCEDURES ARE FOLLOWED TO ENABLE PROPER STORAGE IN THE SWALE AND DISCHARGE TO THE POND.
3. FOR FINAL INSPECTION OF CONSTRUCTED SWALE.
4. AT THE ESTABLISHMENT OF HARD SURFACE STABILIZATION OR 70% VEGETATION COVERS TO ALLOW REMOVAL OF E AND S CONTROLS.

LONG TERM OPERATION AND MAINTENANCE SCHEDULE

ALL BMPS SHOULD BE PROPERLY MAINTAINED TO ENSURE THEIR EFFECTIVENESS. SHEET FLOW CONDITIONS AND INFILTRATION MUST BE SUSTAINED THROUGHOUT THE LIFE OF THE BMP. INSPECT BMPS FOR CLOGGING FROM SEDIMENT OF DEBRIS, DAMAGE BY FOOT OR VEHICULAR TRAFFIC, AND FLOW CHANNELIZATION. INSPECTIONS SHOULD BE MADE ON A QUARTERLY BASIS FOR THE FIRST TWO YEARS FOLLOWING INSTALLATION, AND THEN TWICE PER YEAR THEREAFTER. INSPECTIONS SHOULD ALSO BE MADE AFTER EVERY STORM EVENT GREATER THAN 1 INCH DURING THE ESTABLISHMENT PERIOD.

OPERATION AND MAINTENANCE GUIDELINES SHOULD BE PROVIDED TO ALL FACILITY OWNERS AND TENANTS. SEDIMENT AND DEBRIS SHOULD BE ROUTINELY REMOVED UPON OBSERVATION. IF EROSION IS OBSERVED, MEASURES SHOULD BE TAKEN TO IMPROVE DISPERSION METHOD TO ADDRESS THE SOURCE OF EROSION.

SEDIMENT SHOULD BE REMOVED WHEN THE BMP IS THOROUGHLY DRY. TRASH AND DEBRIS REMOVED FROM THE SITE SHOULD BE DEPOSITED ONLY AT SUITABLE DISPOSAL/RECYCLING SITES AND MUST COMPLY WITH APPLICABLE LOCAL, STATE, AND FEDERAL WASTE REGULATIONS.

GRASS COVER SHOULD BE MOWED WITH LOW GROUND PRESSURE EQUIPMENT AS NEEDED TO CONTROL NOXIOUS WEEDS. MOWING SHOULD BE DONE ONLY WHEN THE SOIL IS DRY IN ORDER TO PREVENT TRACKING DAMAGE TO VEGETATION, SOIL COMPACTION, AND FLOW CONCENTRATIONS. IF VEGETATIVE COVER IS NOT FULLY ESTABLISHED WITHIN THE DESIGNATED TIME, IT SHOULD BE REPLACED WITH AN ALTERNATIVE SPECIES. UNWANTED OR INVASIVE GROWTH SHOULD BE REMOVED ON AN ANNUAL BASIS.

VEGETATED AREAS WILL BE INSPECTED WEEKLY AND AFTER RUNOFF EVENTS UNTIL PERMANENT VEGETATION IS ACHIEVED. ONCE THE VEGETATION IS ESTABLISHED, INSPECTIONS OF HEALTH, DIVERSITY, AND DENSITY SHOULD BE PERFORMED AT LEAST TWICE PER YEAR, DURING BOTH THE GROWING AND NON–GROWING SEASON. VEGETATIVE COVER SHOULD BE SUSTAINED AT 85% AND REESTABLISHED IF DAMAGE GREATER THAN 50% IS OBSERVED.

DAMAGED BMPS WILL BE REPAIRED AS SOON AS POSSIBLE UPON DISCOVERY. REPAIRS WILL BE MADE TO RESTORE TO BMPS TO THE ORIGINAL DESIGN CONDITION.

WET POND SHOULD BE INSPECTED AT LEAST 4 TIMES PER YEAR AND AFTER MAJOR STORMS (> 2 INCHES PER 24 HOURS) OR RAPID ICE BREAKUP. THE POND DRAIN SHOULD BE INSPECTED AND TESTED 4 TIMES PER YEAR

MATERIAL RECYCLING AND DISPOSAL

IF THE SITE WILL NEED TO HAVE FILL IMPORTED FROM AN OFF–SITE LOCATION, THE RESPONSIBILITY FOR PERFORMING ENVIRONMENTAL DUE DILIGENCE AND THE DETERMINATION OF CLEAN FILL WILL IN MOST CASES RESIDE WITH THE OPERATOR.

IF THE SITE WILL HAVE EXCESS FILL THAT WILL NEED TO BE EXPORTED TO AN OFF–SITE LOCATION, THE RESPONSIBILITY OF CLEAN FILL DETERMINATION AND ENVIRONMENTAL DUE DILIGENCE RESTS ON THE APPLICANT.

IF ALL CUT AND FILL MATERIALS WILL BE USED ON THE SITE, A CLEAN FILL DETERMINATION IS NOT REQUIRED BY THE OPERATOR UNLESS THERE IS A BELIEF THAT A SPILL OR RELEASE OF A REGULATED SUBSTANCE OCCURRED ON SITE.

APPLICANTS AND/OR OPERATORS MUST USE ENVIRONMENTAL DUE DILIGENCE TO ENSURE THAT THE FILL MATERIAL ASSOCIATED WITH THIS PROJECT QUALIFIES AS CLEAN FILL. DEFINITIONS OF CLEAN FILL AND ENVIRONMENTAL DUE DILIGENCE ARE PROVIDED BELOW. ALL FILL MATERIAL MUST BE USED IN ACCORDANCE WITH THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL", DOCUMENT NUMBER 258 2182 773. A COPY OF THIS POLICY IS AVAILABLE ONLINE AT WWW.DEPWEB.STATE.PA.US.

CLEAN FILL IS DEFINED AS: UNCONTAMINATED, NON–WATER SOLUBLE, NON–DECOMPOSABLE, INERT, SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED. (THE TERM "USED ASPHALT" DOES NOT INCLUDE MILLED ASPHALT OR ASPHALT THAT HAS BEEN PROCESSED FOR RE–USE.).

ENVIRONMENTAL DUE DILIGENCE: INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF PROPERTY OWNERSHIP, REVIEW OF PROPERTY USE HISTORY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS. ANALYTICAL TESTING IS NOT A REQUIRED PART OF DUE DILIGENCE UNLESS VISUAL INSPECTION AND/OR REVIEW OF THE PAST LAND USE OF THE PROPERTY INDICATES THAT THE FILL MAY HAVE BEEN SUBJECTED TO A SPILL OR RELEASE OF REGULATED SUBSTANCE. IF THE FILL MAY HAVE BEEN AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE, IT MUST BE TESTED TO DETERMINE IF IT QUALIFIES AS CLEAN FILL. TESTING SHOULD BE PERFORMED IN ACCORDANCE WITH APPENDIX A OF THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL".

FILL MATERIAL THAT DOES NOT QUALIFY AS CLEAN FILL IS REGULATED FILL. REGULATED FILL IS WASTE AND MUST BE MANAGED IN ACCORDANCE WITH THE DEPARTMENT'S MUNICIPAL OR RESIDUAL WASTE REGULATIONS BASED ON 25 PA. CODE CHAPTERS 287 RESIDUAL WASTE MANAGEMENT OR 271 MUNICIPAL WASTE MANAGEMENT, WHICHEVER IS APPLICABLE.

THERMAL IMPACTS

DUE TO THE OVERALL NATURE OF THE PROJECT, THERMAL IMPACTS TO SURFACE WATERS ARE NOT ANTICIPATED. THE PRIMARY MEANS TO ADDRESS THERMAL IMPACTS ON THIS PROJECT IS TO LIMIT THE SIZE AND DURATION OF EXPOSED EARTH.

STORMWATER RUNOFF ASSOCIATED WITH THE INSTALLATION OF THE COMPRESSOR UNITS WILL BE ROUTED THROUGH THE STORMWATER BMP'S DESIGNED TO RETAIN AND INFILTRATE THE FIRST SURGE OF WATER FROM THE SITE. THE FIRST SURGE OF WATER WILL BE THE WARMEST WATER FOR THE DURATION OF THE STORM EVENT AND WILL QUICKLY COOL AS THE STORM EVENT PROGRESSES. THE BMPS ARE DESIGNED TO CAPTURE AND INFILTRATE THIS WARMEST SURGE OF STORMWATER. BASED ON ROUTING CALCULATIONS, STORMWATER IS NOT DISCHARGED FROM THE BMPS FOR THE FIRST 12 HOURS DURING A 100–YEAR/24–HOUR STORM EVENT. THE RETENTION PERIOD IS LONGER FOR LESS INTENSE STORMS. THEREFORE, THROUGH THESE MEASURES, THERE IS NO SIGNIFICANT THERMAL IMPACT TO THE RECEIVING WATERS ANTICIPATED.

ANTIDEGRADATION REQUIREMENTS

THE SITE IS NOT LOCATED IN HIGH QUALITY OR EXCEPTIONAL VALUE WATERSHED AND THEREFORE NEED NOT BE EVALUATED FOR ANTIDEGRADATION REQUIREMENTS.

RIPARIAN BUFFERS

TEMPORARY WORKSPACE ASSOCIATED WITH COMPRESSOR STATION 620 IS LOCATED WITHIN A SMALL PORTION OF A NON–FORESTED RIPARIAN BUFFER OF STREAM S2–T2–620A. AFTER COMPLETING THE CONSTRUCTION ACTIVITIES, THE IMPACTED RIPARIAN AREA WILL BE RESTORED BACK TO PRE–EXISTING CONTOURS AND RESEEDED WITH A RIPARIAN SEED MIX.

THE PCSM PLAN SHALL BE PREPARED BY A PERSON TRAINED AND EXPERIENCED IN EROSION CONTROL METHODS AND TECHNIQUES

THESE PLANS AND NARRATIVE WERE PREPARED BY BY KEVIN CLARK, PE (BAI GROUP, LLC) OF STATE COLLEGE, PA IN ACCORDANCE WITH THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION EROSION AND SEDIMENT POLLUTION CONTROL PROGRAM MANUAL, MARCH 2012. PLAN PREPARER'S RESUME IS PROVIDED IN ATTACHMENT E).

NON–STRUCTURAL AND STRUCTURAL WATER QUALITY BMP DESCRIPTION

1. LIMIT OF DISTURBANCE WILL BE MINIMIZED TO THE MAXIMUM EXTENT POSSIBLE BY DISTURBING ONLY THOSE AREAS NECESSARY TO COMPLETE THE PROPOSED EARTHWORK AND BMP INSTALLATIONS.
2. SENSITIVE FEATURES SUCH AS WETLANDS AND RIPARIAN BUFFERS WILL BE PROTECTED TO THE MAXIMUM EXTENT POSSIBLE. THESE AREAS WILL BE CLEARLY DELINEATED IN THE FIELD AND PROTECTED PRIOR TO ANY CONSTRUCTION ACTIVITIES TAKING PLACE. EXISTING VEGETATION IS NOT TO BE REMOVED FROM THE PROTECTED AREA AND THE AREAS SHALL NOT BE SUBJECT TO GRADING OR MOVEMENT OF EXISTING SOILS. ANY PROTECTED AREAS THAT HAVE BEEN DISTURBED/COMPACTED DURING CONSTRUCTION WILL BE RESTORED USING SOIL AMENDMENT AND RESTORATION.
3. TEMPORARILY IMPACTED RIPARIAN BUFFER WILL BE FULLY RESTORED TO ITS PREEXISTING CONDITIONS
4. DISTURBED AREAS THAT ARE NOT PROPOSED TO BE IMPERVIOUS WILL BE REVEGETATED AS PER THE SEEDING AND MULCHING NOTES PROVIDED IN PCSM PLAN NOTES.
5. WET DETENTION POND AND VEGETATED SWALE WILL ACT AS WATER QUALITY BMPS. RELATIVELY STEEPER SLOPES ARE UTILIZED FOR THE WET POND EMBANKMENTS TO MINIMIZE DISTURBED AREA.

WHM consulting, INC. designs, permits, resolutions | BAI GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN C. CLARK — ENGINEER 041211-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN AND DETAILS PER PADEP COMMENTS			

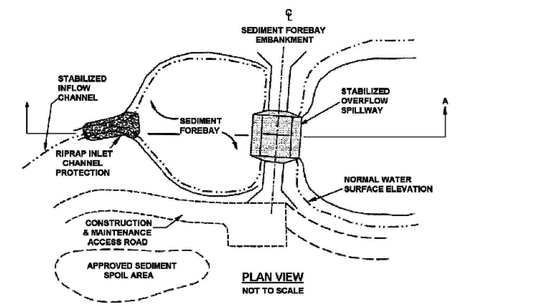
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 620
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

Williams.

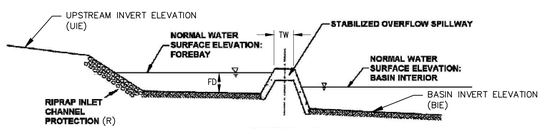
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
NOTES

HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

DRAWN BY: SWH	DATE: 8/05/19	ISSUED FOR BID:	SCALE:
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 4 OF 7
WO: 1211227	RID:		



PLAN VIEW
NOT TO SCALE



SECTION A-A
NOT TO SCALE

NOTES:

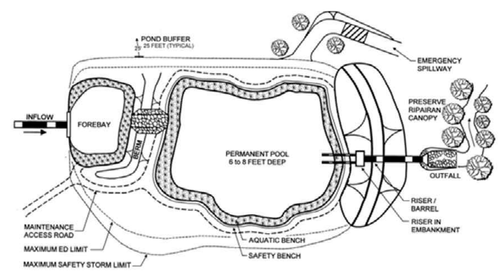
THE OVERFLOW SPILLWAY OF A FOREBAY SHOULD NOT BE A FLOW-THROUGH SPILLWAY. THE BERM SHOULD BE CONSTRUCTED OF NON-PERMEABLE SOILS OR CONCRETE. WHERE SOILS ARE USED, A SUITABLE TYPE OF HARD ARMOR SHOULD BE PROVIDED TO PREVENT SCOUR DURING OVERFLOW.

WHERE NEEDED, FOREBAY EFFICIENCY CAN OFTEN BE INCREASED BY THE PROPER USE OF FLOCCULANTS. MANUFACTURER'S RECOMMENDATIONS SHOULD BE STRICTLY FOLLOWED TO MAXIMIZE EFFICIENCY OF THE FLOCCULANT AND PREVENT CHEMICAL CONTAMINATION.

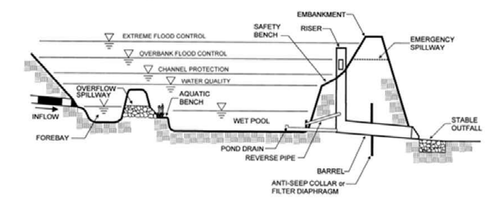
SEDIMENT FOREBAY DEPTH(FT), (FD)	FOREBAY SPILLWAY TOP WIDTH(FT) (TW)	RIPRAP INLET ROCK SIZE(IN) (R)	RIPRAP INLET THICKNESS(IN)	UPSTREAM INVERT(FT) (UIE)	BASIN INVERT (BIE)
4	2	3	9	824.0	818.0

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
SF TYPICAL SEDIMENT FOREBAY



PLAN VIEW

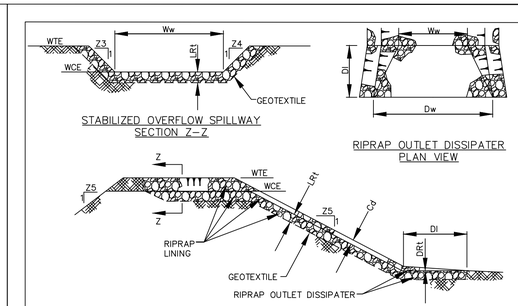


PROFILE

BASE ELEVATION [FT]	TOP ELEVATION [FT]	INSIDE SLOPE	OUTSIDE SLOPE	BASE WIDTH [FT]	BASE LENGTH [FT]	TOTAL BASIN DEPTH [FT]
818.0	824.0	2	3	45	466	6

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WDP WET DETENTION POND WITH FOREBAY



STABILIZED OVERFLOW SPILLWAY
SECTION Z–Z

RIPRAP OUTLET DISSIPATER
PLAN VIEW

STABILIZED OVERFLOW SPILLWAY
PA DEP

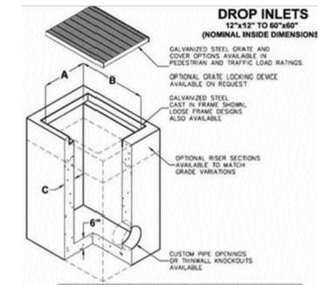
BASIN NO.	WEIR					LINING		CHANNEL		DISSIPATOR			
	Z3 (FT)	Z4 (FT)	TOP ELEV WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	RIPRAP SIZE (R–_)	RIPRAP THICK. LRt (IN)	Z5 (FT)	DEPTH Cd (FT)	LENGTH DI (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R–_)	RIPRAP THICK. DRt (IN)
1	3	3	822.0	820.0	10	3	6	2	1	15	6	3	12

DIMENSION PI SHALL BE 5' MINIMUM.

DISPLACED RIPRAP WITHIN THE SPILLWAY AND/OR OUTLET CHANNEL SHALL BE REPLACED IMMEDIATELY.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

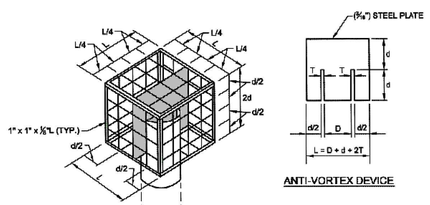
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
FE-1 STABILIZED OVERFLOW SPILLWAY



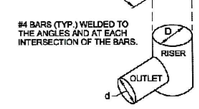
MODEL	A	B	C	WEIGHT CALC - LBS.
1212	12	12	4	208 (BASE) + 266 VF
1616	16	16	5	408 (BASE) + 480 VF
1818	18	18	5	602 (BASE) + 604 VF
2424	24	24	6	675 (BASE) + 750 VF
2436	24	36	6	900 (BASE) + 900 VF
2448	24	48	6	1500 (BASE) + 1050 VF
3030	30	30	6	920 (BASE) + 900 VF
3636	36	36	6	1200 (BASE) + 1050 VF
3648	36	48	6	1500 (BASE) + 1200 VF
4848	48	48	6	1875 (BASE) + 1350 VF
6060	60	60	6	2700 (BASE) + 1650 VF

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
DI DROP INLET DETAIL



ANTI-VORTEX DEVICE



#4 BARS (TYP.) WELDED TO THE ANGLES AND AT EACH INTERSECTION OF THE BARS.

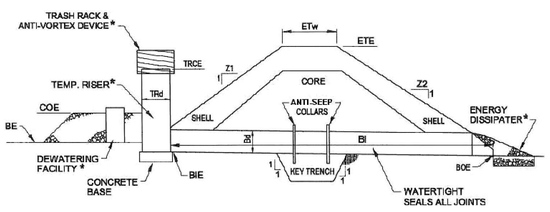
T = THICKNESS OF RISER PIPE.
D = DIAMETER OF RISER PIPE.
d = DIAMETER OF OUTLET PIPE.

RISER DIAMETER (IN)	OUTLET PIPE DIAMETER (IN) (D)	RISER PIPE THICKNESS (IN) (T)	RISER PIPE THICKNESS (IN) (L)
20	15	0.079	36

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TR TRASH RACK AND ANTI-VORTEX DEVICE



BASIN NO.	Z1 (FT)	Z2 (FT)	TEMPORARY RISER			BARREL				
			DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	DIA Bd (IN)	INLET ELEV BIE (FT)	MAT'L	LENGTH (FT)	OUTLET ELEV BOE (FT)
1	3	2	20	821.0	CMP	15	819.0	CMP	100	818.0

EMBANKMENT				CLEANOUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
TOP ELEV ETE (FT)	TOP WIDTH ETw (FT)	KEY TRENCH DEPTH (FT)	KEY TRENCH WIDTH (FT)		
824.0	8	2	4	819.0	818.0

NOTES:

*ALSO REFER TO SEDIMENT BASIN TEMPORARY RISER, EMERGENCY SPILLWAY, ENERGY DISSIPATER, TRASH RACK AND ANTI-VORTEX DEVICE, AND SEDIMENT STORAGE DEWATERING FACILITY DETAILS.

SEDIMENT BASINS, INCLUDING ALL APPURTENANT WORKS, SHALL BE CONSTRUCTED TO THE DETAIL AND DIMENSIONS SHOWN ON THE E&S PLAN DRAWINGS.

AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO A DEPTH OF TWO FEET PRIOR TO ANY PLACEMENT AND COMPACTION OF EARTHEN FILL. FILL MATERIAL FOR THE EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIALS. THE EMBANKMENT SHALL BE COMPACTED IN LAYERED LIFTS OF NOT MORE THAN 6" TO 9". THE MAXIMUM ROCK SIZE SHALL BE NO GREATER THAN ⅔ THE LIFT THICKNESS. UPON COMPLETION, THE EMBANKMENT SHALL BE SEEDED AND MULCHED OR OTHERWISE STABILIZED ACCORDING TO THE SPECIFICATIONS OF THE E&S PLAN DRAWINGS. TREES SHALL NOT BE PLANTED ON THE EMBANKMENT.

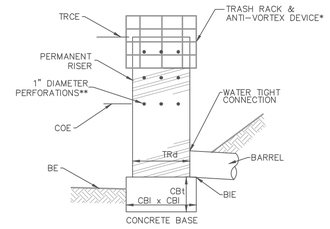
ACCESS SHALL BE PROVIDED FOR SEDIMENT REMOVAL AND OTHER REQUIRED MAINTENANCE ACTIVITIES.

A CLEAN OUT STAKE SHALL BE PLACED NEAR THE CENTER OF EACH BASIN. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT HAS REACHED THE CLEAN OUT ELEVATION ON THE STAKE AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS. DISPOSE OF MATERIALS REMOVED FROM THE BASIN IN THE MANNER DESCRIBED IN THE E&S PLAN.

WET POND SHOULD BE INSPECTED AT LEAST 4 TIMES PER YEAR AND AFTER MAJOR STORMS (> 2 INCHES PER 24 HOURS) OR RAPID ICE BREAKUP. THE POND DRAIN SHOULD BE INSPECTED AND TESTED 4 TIMES PER YEAR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WPE WET POND EMBANKMENT AND SPILLWAY DETAILS – PERFORATED RISER



* SEE STANDARD CONSTRUCTION DETAIL #7–5, TRASH RACK AND ANTI–VORTEX DEVICE
** LOWEST ROW OF HOLES AT SEDIMENT CLEAN–OUT ELEVATION

BASIN NO.	PERMANENT RISER			PERFORATIONS				CONCRETE BASE		BARREL
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	LOWEST ROW OF HOLES ELEV (FT)	NO. ROWS**	NO. HOLES PER ROW	VERT. SPACING OF ROWS (FT)	LENGTH AND WIDTH CBI (IN)	THICKNESS CBt (IN)	INLET ELEV BIE (FT)
1	20	821.0	CMP	819.0	3	2	3	40	12	819.0

NOTES:

*SEE STANDARD CONSTRUCTION DETAIL #7–5, TRASH RACK AND ANTI–VORTEX DEVICE
**LOWEST ROW OF HOLES AT SEDIMENT CLEAN–OUT ELEVATION.

A MINIMUM 2 #8 REBAR SHALL BE PLACED AT RIGHT ANGLES AND PROJECTING THROUGH SIDES OF RISER TO ANCHOR IT TO CONCRETE BASE. REBAR SHALL PROJECT A MINIMUM OF ¼ RISER DIAMETER BEYOND OUTSIDE OF RISER.

CONCRETE BASE SHALL BE POURED IN SUCH A MANNER SO AS TO INSURE THAT CONCRETE FILLS BOTTOM OF RISER TO INVERT OF THE OUTLET PIPE TO PREVENT RISER FROM BREAKING AWAY FROM THE BASE. MINIMUM BASE WIDTH EQUALS 2 TIMES RISER DIAMETER.

EMBEDDED SECTION OF ALUMINUM OR ALUMINIZED PIPE SHALL BE PAINTED WITH ZINC CHROMATE OR EQUIVALENT.

CLOGGED OR DAMAGED SPILLWAYS SHALL BE REPAIRED IMMEDIATELY. TRASH AND OTHER DEBRIS SHALL BE REMOVED FROM THE BASIN AND RISER.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
WP–2 WET POND PERMANENT RISER

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REVISIONS

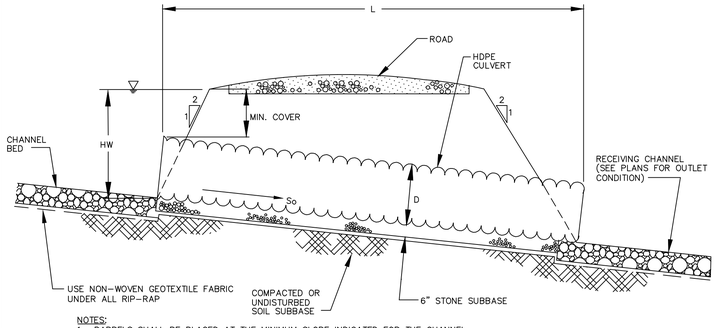
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN AND DETAILS PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 620
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS SHEET 1

HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

DRAWN BY: SWH	DATE: 8/05/19	ISSUED FOR BID:	SCALE:
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 5 OF 7



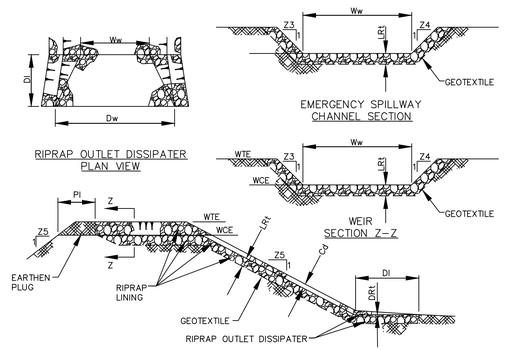
NOTES:
1. BARRELS SHALL BE PLACED AT THE MINIMUM SLOPE INDICATED FOR THE CHANNEL.
2. AN ADDITIONAL 0.5 OF FREEBOARD SHALL BE PROVIDED IN THE CHANNEL ON THE INVERT SIDE OF THE CULVERT.
3. IF MULTIPLE BARRELS ARE USED, THEY SHALL BE PLACED SUCH THAT THERE IS A MINIMUM OF 1 BARREL WIDTH BETWEEN.
4. CORRUGATED METAL OR HDPE MAY BE USED UPON EVALUATION BY AN ENGINEER.

I.D.	Drainage Area [ac]	Req'd Flow [cfs]	Length (ft)	Inlet Invert (ft)	Outlet Invert (ft)	Slope (ft/ft)	No. of Pipes	Pipe Diameter [in]
CULVERT #1	2.15	1.94	63.5	834.0	833.0	0.016	1	24
CULVERT #2	5.02	2.94	35.25	832.0	831.0	0.028	1	24
CULVERT #3	2.87	0.22	56.25	831.5	830.0	0.027	1	18
CULVERT #4	0.97	6.73	46.07	835.0	834.0	0.019	1	18
CULVERT #5	0.32	2.24	40.92	835.0	834.0	0.019	1	18
CULVERT #6	0.88	6.04	29.40	836.0	835.5	0.009	1	18

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
RC TYPICAL ACCESS ROAD CULVERT

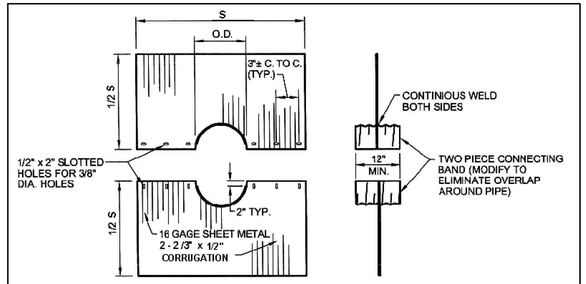


EMBANKMENT SECTION ALONG EMERGENCY SPILLWAY

BASIN NO.	WEIR					LINING		CHANNEL		DISSIPATOR			
	Z3 (FT)	Z4 (FT)	TOP ELEV WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. LR1 (IN)	Z5 (FT)	DEPTH Cd (FT)	LENGTH Dl (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. DR1 (IN)
1	3	3	824.0	822.0	10	3	6	2	1	15	6	3	12

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WP-1 WET POND EMERGENCY SPILLWAY WITH RIPRAP LINING



NOTES:

COLLAR SHALL BE OF SAME GAGE AND WITH SAME COATING AS PIPE WITH WHICH IT IS USED. INSTALL WITH CORRUGATIONS VERTICAL.

MINIMUM DISTANCE TO PIPE JOINT SHALL BE 2 FEET.

ALL COLLARS SHALL BE INSTALLED SO AS TO BE WATERTIGHT. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.

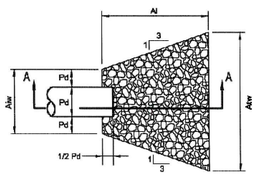
COLLAR SIZE AND SPACING SHALL BE AS INDICATED BELOW:

BASIN OR TRAP NO.	PIPE SIZE (IN)	S (IN)	NO. OF COLLARS	RISER TO FIRST COLLAR (FT)	COLLAR SPACING (FT)
1	15	42	2	5	8

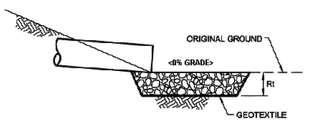
PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
C METAL ANTI-SEEP COLLAR FOR BASINS OR TRAPS



PLAN VIEW



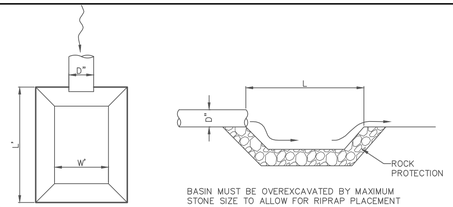
SECTION A - A

NO.	PIPE DIA Do (IN)	MAN "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
CULVERT #1 OUTLET	24	0.012	0.016	1.94	0.62	R-4	18	12	6	18
CULVERT #2 OUTLET	24	0.012	0.028	2.94	0.94	R-4	18	12	6	18
CULVERT #3 OUTLET	18	0.012	0.027	0.22	0.12	R-3	9	8	4.5	12
CULVERT #4 OUTLET	18	0.012	0.019	6.73	2.12	R-3	9	8	4.5	12
CULVERT #5 OUTLET	18	0.012	0.019	2.24	1.25	R-3	9	8	4.5	12
CULVERT #6 OUTLET	18	0.012	0.009	6.04	1.9	R-3	9	8	4.5	12
CHANNEL #9 OUTLET	24	0.058	0.05	2.79	1.1	R-4	18	12	6	18

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
OP RIPRAP APRON OUTLET PROTECTION



BASIN MUST BE OVEREXCAVATED BY MAXIMUM STONE SIZE TO ALLOW FOR RIPRAP PLACEMENT

NOTES:

ALL OUTLET BASINS SHALL BE INSPECTED ON AT LEAST A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT.

DISPLACED RIPRAP WITHIN THE OUTLET BASIN SHALL BE REPLACED IMMEDIATELY.

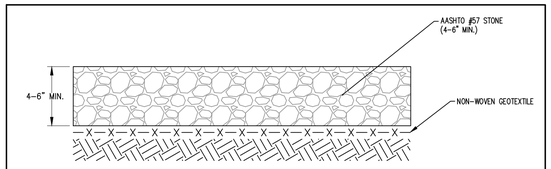
SIDE SLOPES SHALL NOT EXCEED 1.5X:1V

ID	PIPE DIAMETER, D (IN)	FLOW, Q (CFS)	OUTLET BASIN WIDTH, W (FT)	OUTLET BASIN LENGTH, L (FT)	OUTLET BASIN DEPTH (FT)	RIPRAP ROCK SIZE	ROCK THICKNESS (IN)
SED BASIN/WET POND OUTLET	15	2.02	32	192.00	1.00	R-3	9

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
OB OUTLET BASIN DETAIL

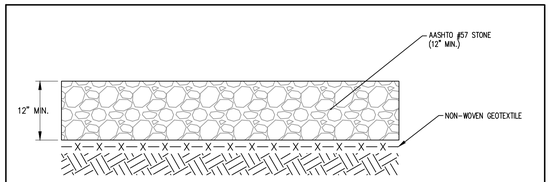


NOTES:
1. CROSS SECTION TO BE APPLIED TO DRY AREAS WITHOUT DRAINAGE CONCERNS.
2. EXISTING MATERIAL TO BE REMOVED AND STOCKPILED IN AN APPROVED LOCATION ONLY.
3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

PENNSYLVANIA

DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
CP COMPRESSOR PAD

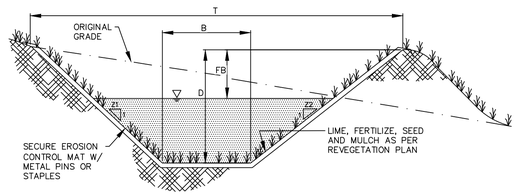


NOTES:
1. CROSS SECTION TO BE APPLIED TO DRY AREAS WITHOUT DRAINAGE CONCERNS.
2. EXISTING MATERIAL TO BE REMOVED AND STOCKPILED IN AN APPROVED LOCATION ONLY.
3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
AR PERMANENT/TEMPORARY STONE ACCESS ROAD



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
CC TYPICAL COLLECTION CHANNEL (GRASS-LINED)

Channel ID.	LENGTH [FT]	SLOPE [%]	BASE WIDTH [FT]	DEPTH [FT]	SIDE SLOPES [Z1/Z2]	TOP WIDTH [FT]	LINING	OUTLET
1	570	1.7	2	2.00	2/1	6.0	VEGETATED ECM (SC250)	CULVERT #1
2	274	1.7	2	2.00	2/1	6.0	VEGETATED ECM (SC250)	CULVERT #1
3	347	0.6	2	2.00	2/1	6.0	VEGETATED ECM (SC250)	CULVERT #2
4	277	1	2	2.00	2/1	5.0	VEGETATED ECM (SC250)	CULVERT #2
5	211	2.5	2	2.00	2/1	5.0	VEGETATED ECM (SC250)	CHANNEL #7
6	494	2.2	2	2.00	2/1	6.0	VEGETATED ECM (SC250)	CHANNE L#7
7	123	2.2	2	2.00	2/1	7.0	VEGETATED ECM (SC250)	VEGETATED SWALE
8	445	3.6	2	2.00	2/1	6.0	VEGETATED ECM (SC250)	CHANNEL #12
9	231	0.5	2	2.00	2/1	5.0	VEGETATED ECM (SC250)	CHANNEL #1
10	484	2.4	2	2.00	2/1	6.0	VEGETATED ECM (SC250)	CULVERT #3
11	295	2.6	2	2.00	2/1	5.0	VEGETATED ECM (SC250)	CHANNEL #12
12	90	2.6	2	2.00	2/1	7	VEGETATED ECM (SC250)	SED BASIN/WET POND

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

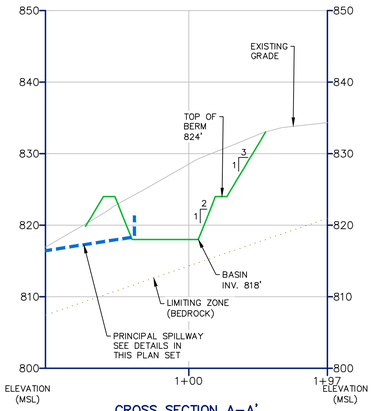
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN AND DETAILS PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 620
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

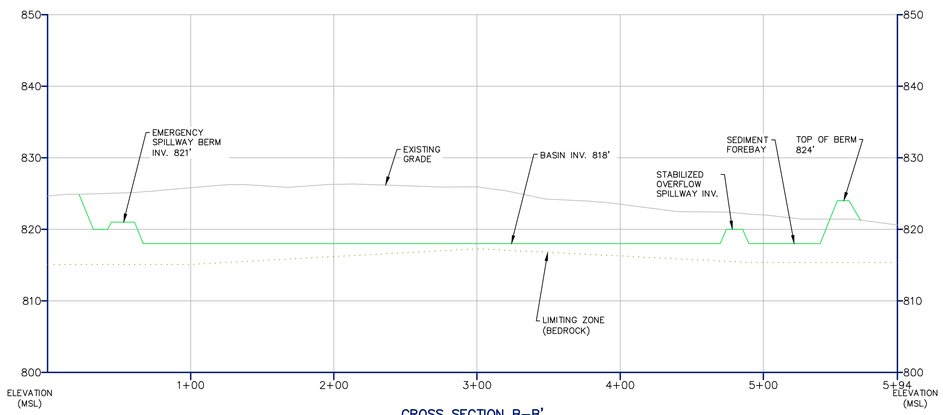
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS SHEET 2

HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

DRAWN BY: SWH	DATE: 8/05/19	ISSUED FOR BID:	SCALE:
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 6 OF 7
WO: 1211227	RID:		



CROSS SECTION A–A'
HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=10'



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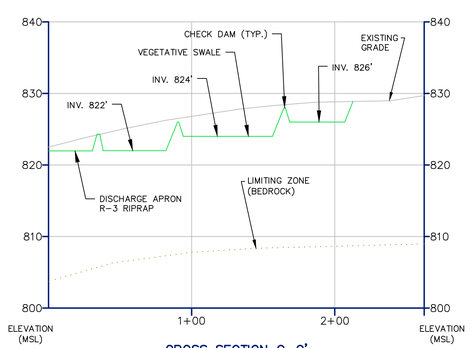
VERTICAL SCALE: 1"=10'



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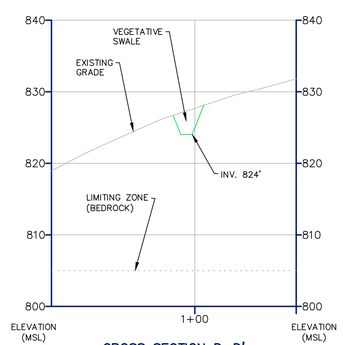
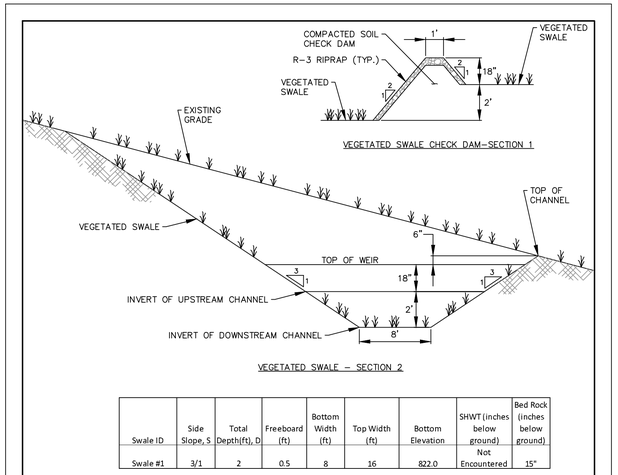
VERTICAL SCALE: 1"=10'



CROSS SECTION D–D'
HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=10'

SCALE
50 25 0 50
SCALE 1" =50'



Swale ID	Side Slope, S	Total Depth(ft), D	Freeboard (ft)	Bottom Width (ft)	Top Width (ft)	Bottom Elevation	SHWT (inches below ground)	Bed Rock (inches below ground)
Swale #1	3/1	2	0.5	8	16	822.0	Not Encountered	15"

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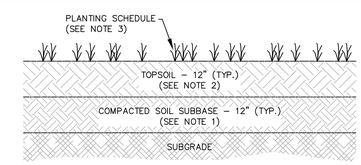
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

VS VEGETATED SWALE



SEDIMENT BASIN LINER

1. COMPACTED SOIL SUBBASE SHALL HAVE A MINIMUM COEFFICIENT PERMEABILITY (k) OF 1x10–5 CM/S. SOIL TYPES PERMITTED FOR USE INCLUDE GM, SM, ML, GC, CL. SUBSOIL MATERIAL SHALL BE FREE FROM HARD CLODS, STIFF CLAY, HARDPAN, ASHES, SLAG, CONSTRUCTION, DEBRIS, PETROLEUM HYDROCARBONS, OR OTHER UNDESIRABLE MATERIAL. SUBSOIL MUST NOT BE DELIVERED OR PLACED IN A FROZEN OR MUDDY STATE. COMPACTED SOIL SUBBASE MATERIAL SHALL BE PLACED ON THE BOTTOM AND INTERIOR SIDES OF THE BASIN TO THE TOP OF BERM ELEVATION. COMPACTION EFFORT SHALL BE 95% MODIFIED PROCTOR (ASTM D1557).

2. TOPSOIL SHALL MEET THE FOLLOWING REQUIREMENTS:

   A. USE A MINIMUM OF 12 INCHES OF TOPSOIL IN THE EMERGENT VEGETATION ZONE (LESS THAN 18" DEEP) OF THE POND. IF NATURAL TOPSOIL FROM THE SITE IS TO BE USED IT MUST HAVE AT LEAST 8 PERCENT ORGANIC CARBON CONTENT (BY WEIGHT) IN THE A–HORIZON FOR SANDY SOILS AND 12% FOR OTHER SOIL TYPES.
   B. IF PLANTING SOIL IS BEING IMPORTED IT SHOULD BE MADE UP OF EQUIVALENT PROPORTIONS OF ORGANIC AND MINERAL MATERIALS.
   C. LIME SHOULD NOT BE ADDED TO PLANTING SOIL UNLESS ABSOLUTELY NECESSARY AS IT MAY ENCOURAGE THE PROPAGATION OF INVASIVE SPECIES.
   D. THE FINAL ELEVATIONS AND HYDROLOGY OF THE VEGETATIVE ZONES SHOULD BE EVALUATED PRIOR TO PLANTING TO DETERMINE IF GRADING OR PLANTING CHANGES ARE REQUIRED.

3. SEDIMENT BASIN BOTTOM SHALL BE REVEGETATED WITH ERNST SEEDS ERNMX–128, SEASONALLY FLOODED WILDLIFE FOOD MIX, OR APPROVED EQUAL. SEE BELOW FOR MIX COMPOSITION AND SEEDING RATE.

ERNST SEEDS – SEASONALLY FLOODED WILDLIFE FOOD MIX – ERNMX–128

MIX COMPOSITION
21.5% PANICUM CLANDESTINUM, TIOGA (DEERTONGUE, TIOGA)
20.0% ELYMUS VIRGINICUS, PA ECOTYPE (VIRGINIA WILDRYE, PA ECOTYPE)
16.6% ANDROPOGON GERARDII, 'NIAGARA' (BIG BLUESTEM, 'NIAGARA')
15.0% ECHINOCHLOA CRUSGALLI VAR. FRUMENTACEA (JAPANESE MILLET)
10.0% CAREX VULPINOIDEA, PA ECOTYPE (FOX SEDGE, PA ECOTYPE)
8.0% PANICUM VIRGATUM, 'CAVE–IN–ROCK' (SWITCHGRASS, 'CAVE–IN–ROCK')
4.0% CHAMAECRISTA FASCICULATA, PA ECOTYPE (PARTRIDGE PEA, PA ECOTYPE)
1.5% VERBENA HASTATA, PA ECOTYPE (BLUE VERVAIN, PA ECOTYPE)
1.0% HELIOPSIS HELIANTHOIDES, PA ECOTYPE (OXEYE SUNFLOWER, PA ECOTYPE)
1.0% JUNCUS EFFUSUS (SOFT RUSH)
0.8% AGROSTIS PERENNANS, ALBANY PINE BUSH–NY ECOTYPE (AUTUMN BENTGRASS, ALBANY PINE BUSH–NY ECOTYPE)
0.1% ASCLEPIAS INCARNATA, PA ECOTYPE (SWAMP MILKWEED, PA ECOTYPE)
0.1% ASTER NOVAE–ANGLIAE, PA ECOTYPE (NEW ENGLAND ASTER, PA ECOTYPE)
0.1% EUPATORIUM FISTULOSUM, PA ECOTYPE (JOE PYE WEED, PA ECOTYPE)
0.1% EUPATORIUM PERFOLIATUM, PA ECOTYPE (BONESET, PA ECOTYPE)
0.1% MONARDA FISTULOSA, FORT INDIANTOWN GAP–PA ECOTYPE (WILD BERGAMOT, FORT INDIANTOWN GAP–PA ECOTYPE)
0.1% PYCNANTHEMUM TENUIFOLIUM (NARROWLEAF MOUNTAINMINT)

SEEDING RATE: 20 LB PER ACRE, OR 1/2 LB PER 1,000 SQ FT

PENNSYLVANIA

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

WET POND LINING DETAIL

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KEVIN C. CLARK
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047274-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

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1	05/04/20	SWH	UPDATED GRADING PLAN AND DETAILS PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 620
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS SHEET 4

HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

DRAWN BY: SWH	DATE: 8/05/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 7
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 7

Transcontinental Gas Pipe Line Company, LLC

Section 3-4 PCSM Plan for Compressor Station 620

Leidy South Project – Compressor Station 620

September 2019
(Revised May 2020)

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4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 7.b, 7.l, 8.a, 8.e)

- 4.1 Resolutions to Soil Limitations
- 4.2 Geologic Formations

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 7.c)

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- 8.1 Permanent Stabilization
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10.0 Recycling and Disposal of Materials (NOI Checklist Item 7.k)

11.0 Thermal Impacts (NOI Checklist Item 7.m)

12.0 Antidegradation Requirements (NOI Checklist Item 7.o, 8.f)

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14.0 Offsite Discharge Analysis *(Added May 2020)*

15.0 Non-Structural and Structural Water Quality BMP Description *(Added May 2020)*

16.0 The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques

Attachments

1 Project Location Maps

2 Soils Map and Report

3 Site Evaluation and Soil Infiltration Test Report *(Revised May 2020)*

4 PCSM Plan BMP Design Worksheets and Calculations *(Revised May 2020)*

5 Non-Structural and Structural Water Quality BMPs Map *(Added May 2020)*

6 Offsite Discharge Report *(Added May 2020)*

Drawings (NOI Checklist Item 7.i) *(Revised May 2020)*

1 of 7 Post Construction Stormwater Management Plan Cover

2 of 7 Post Construction Stormwater Management Plan Existing Conditions

3 of 7 Post Construction Stormwater Management Plan Proposed Conditions

4 of 7 Post Construction Stormwater Management Plan Notes

5-7 of 7 Post Construction Stormwater Management Plan Details

1.0 Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Leidy South Project – Compressor Station 620. Compressor Station 620 will consist of installing one gas turbine-driven compressor unit (31,871 nominal HP at ISO conditions) and associated ancillary facilities in Hegins Township, Schuylkill County, Pennsylvania.

Compressor Station 620 is proposed as part of the overall Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

This PCSM Plan has been developed for the Compressor Station 620 site. The PCSM Plan shall be designed and implemented to be consistent with the Post Construction Stormwater Management (PCSM) Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). All work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the Compressor Station 620 site will be approximately 45.3 acres. Subject to receipt of permits and authorizations, Transco anticipates construction of the Project would commence in January 2021 to meet a target in-service date of December 1, 2021.

2.0 Topographic Features of the Area (NOI Checklist Item 7.a)

A Project Location Map for Compressor Station 620 is included in Attachment 1. This map shows the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Tremont, Pennsylvania quadrangles.

3.0 Receiving Surface Waters (NOI Checklist Item 7.e)

The following table (Table 1) lists each watershed located in Compressor Station 620 Project Area, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCGP-3 permit application.

Table 1 – Receiving Waters			
Watershed Name	**Designated Use**	**Existing Use**	**PFBC Classification**
Deep Creek	CWF, MF	-	Stocked Trout
MF: Migratory Fishes, CWF: Cold Water Fishes			

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 7.b, 7.l, 8.a, 8.e)

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 7 soil mapping units located within the LOD, see Table 2 below:

Table 2 – Soils Mapping Units with Limits of Disturbance	
Soil Mapping Unit	**Soil Series**
Ba	Basher silt loam
CaB	Calvin shaly silt loam, 3 to 8 percent slopes
CaC	Calvin shaly silt loam, 8 to 15 percent slopes
LeB	Leck kill channery silt loam, 3 to 8 percent slopes
LeC	Leck kill channery silt loam, 8 to 15 percent slopes
MeB	Meckesville loam, 3 to 8 percent slopes
WKF	Weikert and Klinesville shaly silt loams, steep

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the Compressor Station 620 and resolutions were identified in Section 4.1.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME		CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Basher	Ba	X	C/S			X	X	X	X	X	X	X	X				x
Calvin	CaB, CaC	X	C	X	X			X			X		X				
Leck Kill	LeB, LeC	X	C						X	X	X	X	X				x
Meckesville	MeB	X	C/S				X		X	X	X	X	X				x
Weikert	WKF	X	C/S	X				X	X	X	X	X	X				

4.1 Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.
3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with all local, state, and federal regulations.
4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.
5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation

will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.

6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.
7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.
8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc. to minimize soil erosion.

4.2 Geologic Formations

Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis completed for the Project revealed that the Compressor Station 620 does not cross any known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Compressor Station 620 lies within a zone of moderate to high landslide incidence and susceptibility.

Due to the moderate to high landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed and is submitted with this application (Attachment B). This report provides information about any potential geological hazards occurring in the vicinity of the Compressor Station 620 Project area. The Geological Hazard Assessment and Mitigation Plan also identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 7.c)

Compressor Station 620 will involve installing one gas turbine-driven compressor unit, access road, and ancillary facilities Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (https://www.mrlc.gov/viewer/), it appears that

land use for the past 20 years has been cultivated cropland. Based on the surrounding land characteristics, land use within the past 50 years would likely have been forested land, cropland or meadow. The contractor will construct stormwater BMPs to mitigate the increase in volume and peak rates associated with construction. The proposed BMPs are designed to store the net increase in volume between the pre- and post-development 2-year rain events. Refer to the Stormwater BMP Sizing Calculations in Attachment 4 for additional information.

6.0 Post Construction Stormwater Management Best Management Practices, Installation Sequence and PCSM Critical Stages (NOI Checklist Item 7.f, 7.g)

Increase in stormwater runoff during and after construction shall be controlled by sequencing the operations and using a selection of Best Management Practices (BMPs). Conveyance BMPs, a wet detention pond and a vegetated swale will be installed across the developed area to convey the net increase in volume between the pre and post development 2-year storm events and mitigate the increase (pre-post development) in peak runoff for the 2-, 10-, 50-, and 100-year storm events. Sediment basin used at the Site for E&S control will be dewatered and subsequently regraded as a wet detention pond. Collection channels will be constructed to direct a majority of the runoff from the developed area to the wet detention pond with forebay and infiltration basin All BMP design calculations and drawings are provided in Attachment 4 and PCSM Plan set.

BMP Installation Sequence (NOI Checklist Item 7.g)

The PCSM BMPs should be installed in a manner designed to:

1. Protect BMP areas associated with infiltration from compaction prior to and during installation.
2. Maintain proper Erosion and Sediment Control Measures during construction.
3. Vegetated Swale
    a. Construct and stabilize the swale early in the construction schedule, preferably before mass earthwork and paving increase the rate and volume of runoff.
    b. Rough grade the vegetated swale. Avoid excessive compaction and/or land disturbance.
    c. As needed, remove unsuitable soil (clayey, rocky, coarse sands, etc.) to support dense vegetation, replacing with approximately 12 inches of loamy or sandy soils. Alkaline soils are recommended to further reduce and retain

metals.

d. Install outlet control structure.
e. Final grade the swale to ensure accuracy.
f. Seed and stabilize as soon as possible.
    i. Select dense and diverse close-growing, water-resistant plants whose growing season corresponds to the wet season.
    ii. Vegetation should be selected at an early stage in the design process, with well-defined pollution control goals in mind.
    iii. Selected vegetation must be able to thrive at the specific site and the use of native plant species is strongly advised, as is the avoidance of invasive plant species.
    iv. Swale vegetation must also be salt tolerant, as the paved roadway will undergo winter road maintenance activities that will contribute to salt/chlorides.
    v. The swale is particularly vulnerable to scour and erosion prior to the establishment of vegetation. Protect the seed bed with temporary erosion control, such as straw matting, compost blankets, or curled wood blankets.

4. <u>Wet Detention Pond with Forebay</u>
    a. Dewater the sediment basin and flush out the outlet pipe and outlet basin to clean excess accumulated sediment.
    b. Remove any temporary risers from the basin and install permanent risers
    c. Make any necessary repairs to the basin bottom and inside slopes. This includes repairs to the 12” compacted soil subbase and/or 12” topsoil cover.
    d. Remove existing vegetation from the basin bottom. Apply erosion control measures as necessary.
    e. As areas are completed, seed, plant and mulch in accordance with the section below.
    f. Install anti-grazing measures, if necessary

g. Wet pond bottom shall be revegetated with ERNST seeds ERNMX-128, seasonally flooded wildlife food mix, or approved equal. Where necessary, reseed and mulch interior side slopes with same seed mix utilized for revegetating the sedimentation basin.

5. Select plants that are well adapted to the specific site conditions. Meadow plants must be able to out compete weed species in the first few years as they become established.
6. All temporary E&S BMPs will be removed following site stabilization. Do not remove other Erosion and Sediment Control measures until site is fully stabilized.
7. All installed BMPs will be monitored until final site stabilization is achieved.
8. Follow long term operation and maintenance guidelines discussed below.

PCSM Critical Stages

Critical points requiring visits by the licensed professional or delegate are as follows:

1. Following final grading and seeding of the collection channels, wet pond and infiltration basin in order to confirm they have been constructed according to the plan details for proper collection, infiltration, and conveyance of runoff. Periodic assessments will need to be made to ensure that accumulated sediment should be cleaned out so the basin maintains necessary design volume.
2. During the layout and excavation of the outlet structures, the professional or delegate will ensure sizing, materials specifications, and construction procedures are followed to enable proper storage and discharge to the pond/basin.
3. For final inspection of constructed BMPs.
4. At the establishment of hard surface stabilization or 70% vegetation covers to allow removal of E & S controls.

7.0 Net Change in Volume and Rate of Runoff (NOI Checklist Item 7.d, 8.b, 8.c, 8.d)

An analysis of pre- and post-development stormwater runoff was performed for the proposed Compressor Station 620. The installation of compressor units and construction of parking area and access road will increase the volume of stormwater runoff between the pre and post development 2 year rain event due to the increase in the type and size of the impervious area. The increase in impervious area will increase the pre to post development peak runoff for the 1, 2, 10, 25, 50, and 100 year storm events. Design calculations using HydroCAD software

are included in Attachment 4. Refer to the Post-Construction Stormwater Management (PCSM) Plan drawings for additional information.

Pre- and Post-Construction Stormwater Volume for 2-yr Rainfall event

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction after BMPs (cf)	Net (cf)
15,530	31,324	567	-14,963

Pre-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.65	2.27	10.87	19.63	28.69	41.14

Post-Construction Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
3.13	6.56	19.69	31.39	42.98	58.81

Post-Construction w/ BMPs Peak Discharge Rates (cfs)

1-year	2-year	10-year	25-year	50-year	100-year
0.00	0.05	1.48	8.09	10.23	14.81

Difference between Pre-Construction and Post-Construction w/ BMPs

	1-year	2-year	10-year	25-year	50-year	100-year
NET Difference	-0.65	-2.22	-9.39	-11.54	-18.46	-26.33

8.0 Temporary and Permanent Stabilization

Appropriate seed mixtures for temporary and permanent stabilization are outlined on the notes sheet of the plan drawings.

8.1 Permanent Stabilization

Upon final completion of an earth disturbance activity or any stage or phase of an activity, the site shall immediately have topsoil restored, replaced, or amended, seeded, mulched or otherwise permanently stabilized and protected from accelerated erosion and sedimentation. E&S BMPs shall be implemented and maintained until the permanent stabilization is completed. Once permanent stabilization has been established, the temporary E&S BMPs shall be removed. Any areas disturbed in the act of removing temporary E&S BMPs shall be permanently stabilized upon completion of the temporary E&S BMP removal activity. For an earth disturbance activity or any

stage or phase of an activity to be considered permanently stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which permanently minimizes accelerated erosion and sedimentation. When erosion and sedimentation controls are to be removed in agricultural non-sensitive areas (streams/wetlands), agricultural landowners shall maintain agricultural BMPs per PaDEP regulations.

8.2 Temporary Stabilization

Upon temporary cessation of an earth disturbance activity or any stage or phase of an activity where a cessation of earth disturbance activities will exceed 4 days (including agricultural areas), the site shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage or phase of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which temporarily minimizes accelerated erosion and sedimentation.

8.3 Stabilization During Non-Growing Season

When utility construction must be done and is completed during a non-growing season, interim stabilization BMPs must be implemented and adequately maintained. The application of straw mulch at the rate of 3.0 tons per acre is required. The BMPs should be inspected weekly (unless snow covered) and after each runoff event to identify areas that become bare. All temporary erosion and sediment pollution controls must be maintained.

8.4 Riparian Buffer Stabilization

Temporary Cover for riparian areas to include see from mixture 1 from Table 11.4 (provided in the PCSM Plan set), at the outlined seeding rate. Permanent cover for riparian areas will include 20 lbs/acre of Ernst 178 Riparian buffer mix. Where Slopes exceed 10%, seed Mixture 2 from Table 11.4 shall be utilized.

9.0 Long Term Operation and Maintenance Schedule (NOI Checklist Item 7.j)

All BMPs should be properly maintained to ensure their effectiveness. Sheet flow conditions and infiltration must be sustained throughout the life of the BMP. BMPs should be inspected for clogging from sediment of debris, damage by foot or vehicular traffic, and flow channelization. Inspections should be made on a quarterly basis for the first two years following installation, and then twice per year thereafter. Inspections should also be made after every storm event greater than 1 inch during the establishment period.

Channel linings should be inspected for signs of erosion or dislodging, as applicable. Channels should be inspected for debris, overgrown vegetation, and other blockages. Catch Basins and Inlets should be inspected and cleaned at least two times per year and after runoff events. Vegetation along the surface of the infiltration basin should be maintained in good conditions. Vehicles should not be parked or driven on an infiltration basin and care should be taken to avoid excessive compaction by mowers. Inspect the basin after runoff events and make sure that runoff drains within 72 hours. Wet pond should be inspected at least 4 times per year and after major storms (> 2 inches per 24 hours) or rapid ice breakup. The pond drain should be inspected and tested 4 times per year.

Operation and maintenance guidelines should be provided to all facility owners and tenants. Sediment and debris should be routinely removed upon observation. If erosion is observed, measures should be taken to improve the dispersion method to address the source of erosion. Sediment should be removed when the BMP is thoroughly dry. Trash and debris removed from the site should be deposited only at suitable disposal/recycling sites and must comply with applicable local, state, and federal waste regulations. Grass cover should be mowed with low ground pressure equipment as needed to control noxious weeds. Mowing should be done only when the soil is dry in order to prevent tracking damage to vegetation, soil compaction, and flow concentrations. If vegetative cover is not fully established within the designated time, it should be replaced with an alternative species. Unwanted or invasive growth should be removed on an annual basis.

Vegetated areas will be inspected weekly and after runoff events until permanent vegetation is achieved. Once the vegetation is established, inspections of health, diversity, and density should be performed at least twice per year, during both the growing and non-growing season. Vegetative cover should be sustained at 85% and reestablished if damage greater than

50% is observed. Damaged BMPs will be repaired as soon as possible upon discovery. Repairs will be made to restore damaged BMPs to the original design condition.

10.0 Recycling and Disposal of Materials (NOI Checklist Item 7.k)

The restoration will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here):

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Material Safety Data Sheets (MSDSs).

11.0 Thermal Impacts (NOI Checklist Item 7.m)

Thermal impacts to surface waters are not anticipated. Most of the stormwater will be

routed through the stormwater BMP designed to retain and infiltrate the first surge of water from the site. The first surge of water will be the warmest water for the duration of the storm event and will quickly cool as the storm event progresses. The BMPs are designed to capture and infiltrate this warmest surge of stormwater. Based on routing calculations, stormwater is retained in the BMPs for a period of 12 hours before being discharged during a 100-year/24-hour storm event. This retention period is longer for less intense storms. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

12.0 Antidegradation Requirements (NOI Checklist Item 7.o, 8.f)

The Site is not located in a siltation impaired, HQ or EV watershed; therefore, an evaluation for antidegradation requirements was not necessary.

13.0 Riparian Buffers (NOI Checklist Item 7.n)

Temporary workspace associated with Compressor Station 620 is located within a small portion of a non-forested riparian buffer of stream S2-T2-620A. After completing the construction activities, the impacted riparian area will be restored back to pre-existing contours and reseeded with a riparian seed mix.

Because the project is temporary in nature and the site will be fully restored to its preexisting condition leaving riparian buffers undisturbed to the extent practical, it is eligible for the Riparian Buffer Waiver under 25 PA Code §102.14(d)(2)(iv). As such, a Riparian Buffer Waiver has been requested along with this ESCGP-3 application (Section 1-7).

14.0 Offsite Discharge Analysis

The stormwater BMP's being constructed at Compressor Station 620 are in areas that will discharge stormwater to offsite non-surface water. These areas have been analyzed to ensure that these discharges will be non-erosive to adjacent property owners. The analysis has been performed in accordance with PADEP Document 3150-FS-DEP4124, "Off-Site Discharges of Stormwaters to Areas That Are Not Surface Waters". The analysis is presented in Attachment 6- Offsite Discharge Report. Criteria used to determine that offsite erosion at each discharge point will not occur are presented below:

<u>Wet Detention Pond with Forebay</u>

The wet detention pond is in the southern part of the compressor station. The outfall discharges to a sediment trap outlet basin at the eastern corner of the wet pond. Calculations

provided for the project site runoff show that there is no net increase in rate of runoff during any storm event at the outfall. The area downstream of the outfall is over 90% vegetated. Additionally, the velocity coming out of the outfall protection for the 25-yr 24-hr storm event was calculated and found to be 2.49 fps. Since the outlet velocity is below 2.5 fps downstream erosion will be minimal if not negligible.

15.0 Non-Structural and Structural Water Quality BMP Description

Limit of disturbance will be minimized to the maximum extent possible by disturbing only those areas necessary to complete the proposed earthwork and BMP installations.

Sensitive features such as wetlands and riparian buffers will be protected to the maximum extent possible. These areas will be clearly delineated in the field and protected prior to any construction activities taking place. Existing vegetation is not to be removed from the protected area and the areas shall not be subject to grading or movement of existing soils. Any protected areas that have been disturbed/compacted during construction will be restored using soil amendment and restoration.

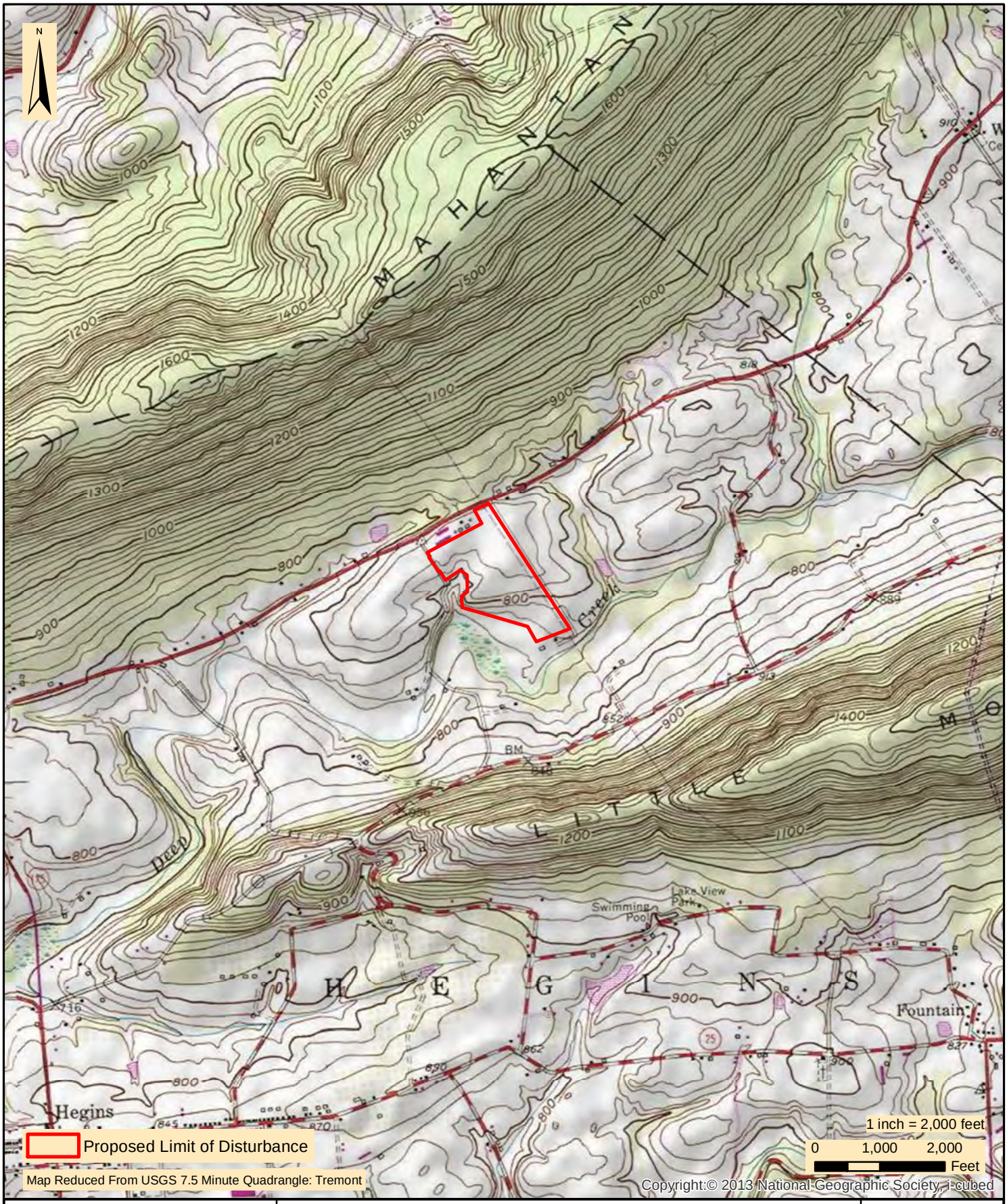
Temporarily impacted riparian buffer will be fully restored to its preexisting conditions. Disturbed areas that are not proposed to be impervious will be revegetated as per the seeding and mulching notes provided in PCSM plan notes.

Wet detention pond and vegetated swale will act as water quality BMPs. Relatively steeper slopes are utilized for the wet pond embankments to minimize disturbed area.

16.0 The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques

These plans and narrative were prepared by Kevin Clark, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Stormwater BMP Manual, December 2006. Plan preparer's resume is provided in Attachment C of the ESCGP-3 permit package).

ATTACHMENT 1
PROJECT LOCATION MAP



WHM consulting, INC.
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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

NEW **PROPOSED** COMPRESSOR STATION 620
PROJECT LOCATION MAP

HEGINS TOWNSHIP SCHUYLKILL COUNTY PENNSYLVANIA

Date:	8/21/2019
WHM Drawing Number:	WILLIAMS206A001
Drawn By:	FTN
Figure Number:	7

ATTACHMENT 2
SOILS MAP AND REPORT

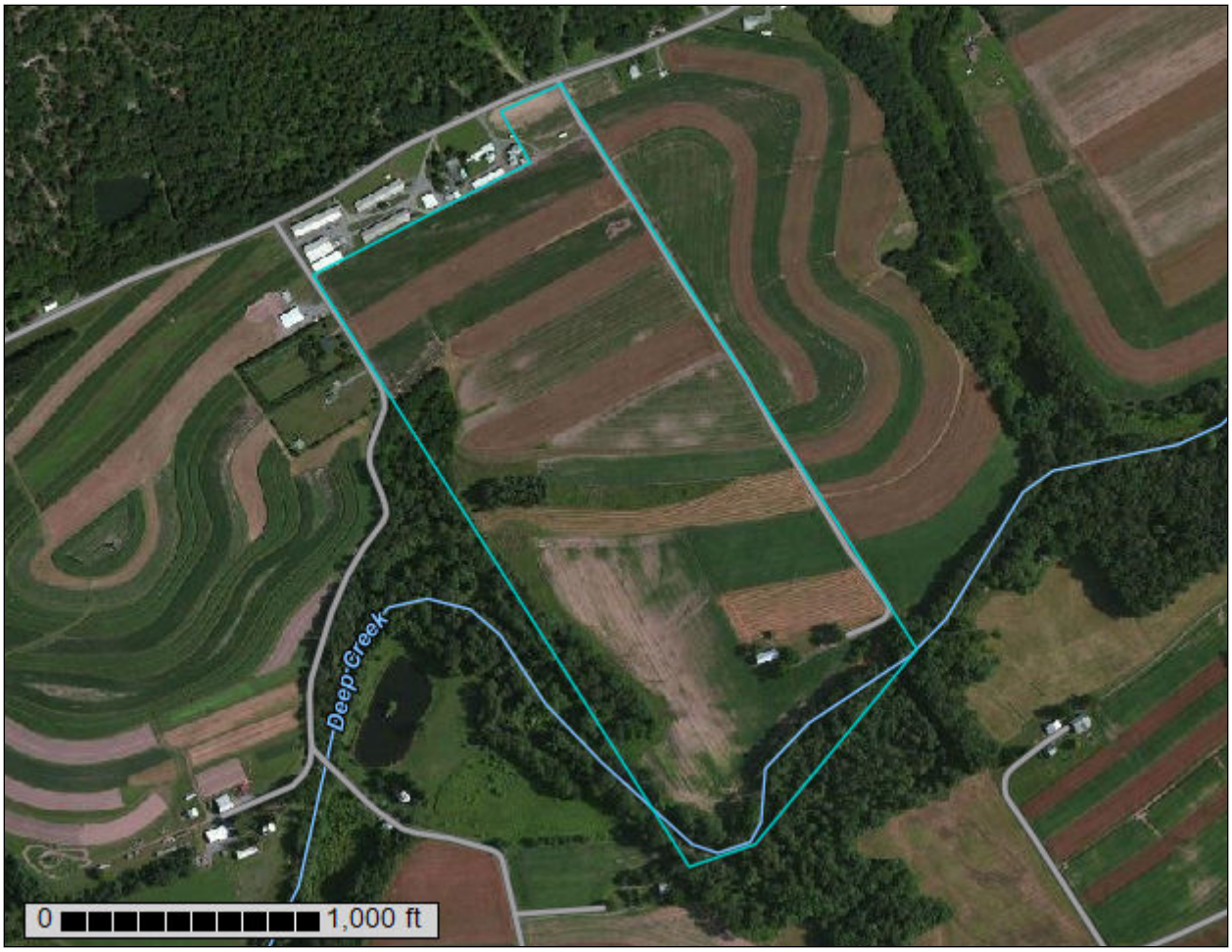
United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Schuylkill County, Pennsylvania

DIEHL_SURVEY_AREA_020419



May 29, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

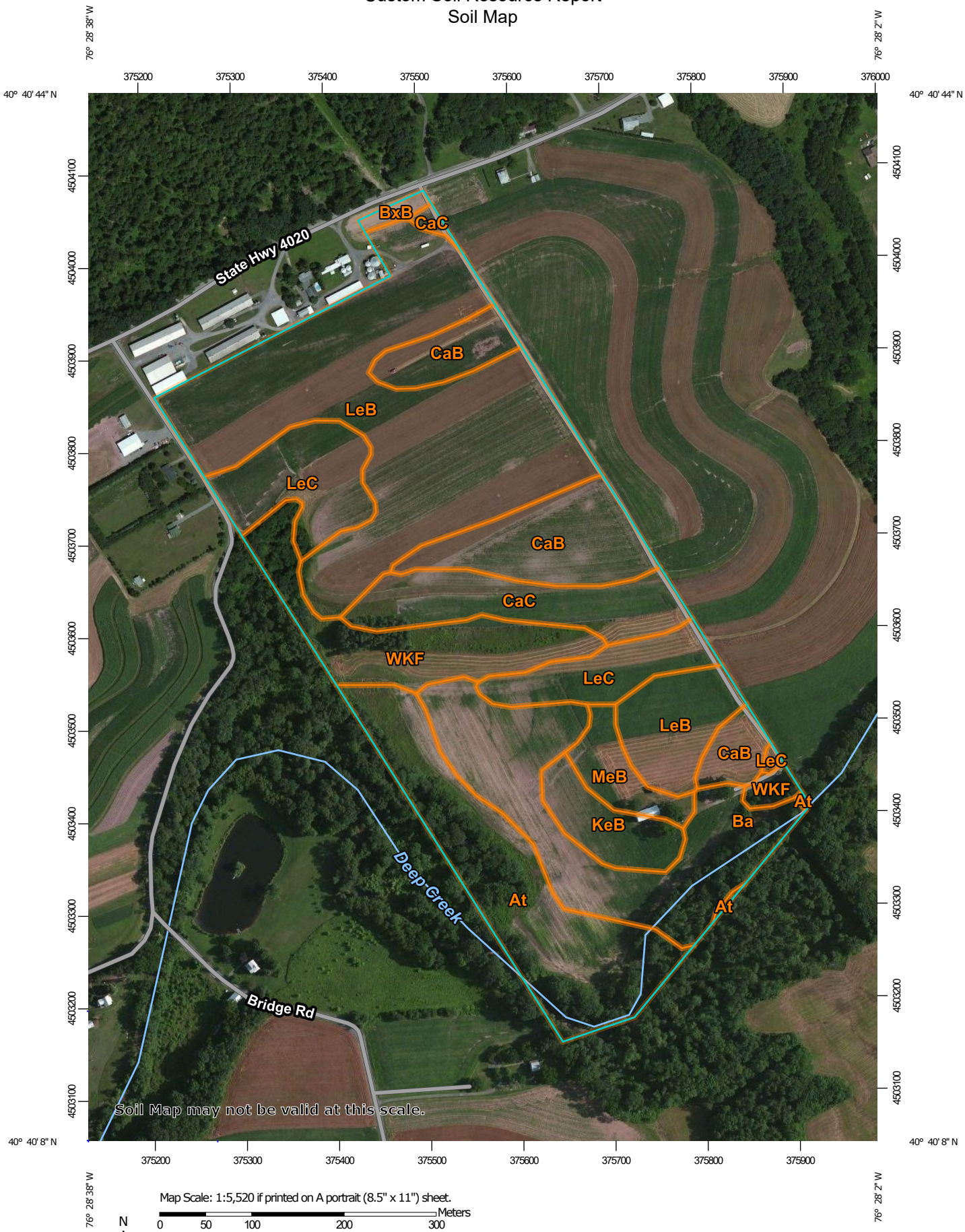
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:5,520 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Schuylkill County, Pennsylvania
Survey Area Data: Version 14, Sep 19, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 26, 2011—Jul 2, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
At	Atkins silt loam	9.9	13.6%
Ba	Basher silt loam	9.8	13.5%
BxB	Buchanan extremely stony loam, 3 to 8 percent slopes	0.3	0.5%
CaB	Calvin shaly silt loam, 3 to 8 percent slopes	7.7	10.5%
CaC	Calvin shaly silt loam, 8 to 15 percent slopes	5.0	6.8%
KeB	Kedron silt loam, 3 to 8 percent slopes	2.4	3.2%
LeB	Leck kill channery silt loam, 3 to 8 percent slopes	23.1	31.7%
LeC	Leck kill channery silt loam, 8 to 15 percent slopes	6.9	9.5%
MeB	Meckesville loam, 3 to 8 percent slopes	1.8	2.5%
WKF	Weikert and Klinesville shaly silt loams, steep	6.0	8.3%
Totals for Area of Interest		**72.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They

generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Schuylkill County, Pennsylvania

At—Atkins silt loam

Map Unit Setting

National map unit symbol: l3lm
Elevation: 200 to 3,000 feet
Mean annual precipitation: 32 to 55 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Atkins and similar soils: 85 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Atkins

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Acid alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 30 inches: silt loam
H3 - 30 to 60 inches: gravelly silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Philo

Percent of map unit: 6 percent
Hydric soil rating: No

Barbour

Percent of map unit: 6 percent
Hydric soil rating: No

Saprists

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Ba—Basher silt loam

Map Unit Setting

National map unit symbol: l3ln
Elevation: 200 to 1,000 feet
Mean annual precipitation: 32 to 46 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 120 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Basher and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Basher

Setting

Landform: Flood plains
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy alluvium derived from shale and siltstone

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 27 inches: silt loam
H3 - 27 to 42 inches: gravelly loam
H4 - 42 to 60 inches: very gravelly fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 72 to 99 inches to
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Atkins

Percent of map unit: 7 percent
Landform: Flood plains
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Barbour

Percent of map unit: 3 percent
Hydric soil rating: No

BxB—Buchanan extremely stony loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l3lv
Elevation: 400 to 3,800 feet
Mean annual precipitation: 34 to 46 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Buchanan, extremely stony, and similar soils: 85 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buchanan, Extremely Stony

Setting

Landform: Mountain slopes, valley sides
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Colluvium derived from sandstone and shale

Typical profile

H1 - 0 to 10 inches: channery loam
H2 - 10 to 21 inches: gravelly loam
H3 - 21 to 60 inches: gravelly loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Laidig

Percent of map unit: 7 percent
Hydric soil rating: No

Andover, extremely stony

Percent of map unit: 7 percent
Landform: Depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

CaB—Calvin shaly silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l3lx
Elevation: 300 to 1,500 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Calvin and similar soils: 80 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calvin

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Red, residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 8 inches: channery silt loam
H2 - 8 to 26 inches: very channery silt loam
H3 - 26 to 40 inches: extremely channery silt loam
H4 - 40 to 44 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Albrights

Percent of map unit: 5 percent
Hydric soil rating: No

Lehew

Percent of map unit: 5 percent
Hydric soil rating: No

Berks

Percent of map unit: 3 percent
Hydric soil rating: No

Klinesville

Percent of map unit: 2 percent
Hydric soil rating: No

CaC—Calvin shaly silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l3ly
Elevation: 300 to 1,600 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Calvin and similar soils: 80 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calvin

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Red, residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 8 inches: channery silt loam
H2 - 8 to 26 inches: very channery silt loam
H3 - 26 to 40 inches: extremely channery silt loam
H4 - 40 to 44 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Klinesville

Percent of map unit: 5 percent
Hydric soil rating: No

Berks

Percent of map unit: 5 percent
Hydric soil rating: No

Lehew

Percent of map unit: 3 percent
Hydric soil rating: No

Weikert

Percent of map unit: 2 percent
Hydric soil rating: No

KeB—Kedron silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l3mm
Elevation: 200 to 2,800 feet
Mean annual precipitation: 32 to 48 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Kedron and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kedron

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium and/or till derived from sandstone, siltstone, and shale

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 27 inches: silty clay loam
H3 - 27 to 58 inches: channery loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 32 inches to fragipan

Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Linden
Percent of map unit: 5 percent
Hydric soil rating: No

Wet spots
Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Meckesville
Percent of map unit: 5 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

LeB—Leck kill channery silt loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: l3mw
Elevation: 300 to 2,800 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 130 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Leck kill and similar soils: 85 percent

Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Leck Kill

Setting

Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Reddish residuum derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: channery silt loam
H2 - 10 to 43 inches: channery silt loam
H3 - 43 to 58 inches: very channery silt loam
R - 58 to 62 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 80 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Klinesville

Percent of map unit: 5 percent
Hydric soil rating: No

LeC—Leck kill channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l3mx
Elevation: 500 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 130 to 190 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Leck kill and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Leck Kill

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Reddish residuum derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: channery silt loam
H2 - 10 to 43 inches: channery silt loam
H3 - 43 to 58 inches: very channery silt loam
R - 58 to 62 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 40 to 80 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

MeB—Meckesville loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l3n4
Elevation: 500 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 130 to 190 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Meckesville and similar soils: 85 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Meckesville

Setting

Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 31 inches: gravelly loam
H3 - 31 to 70 inches: gravelly loam
H4 - 70 to 96 inches: gravelly loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 25 to 48 inches to fragipan; 60 to 99 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 25 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Kedron
Percent of map unit: 5 percent
Hydric soil rating: No

Leck kill
Percent of map unit: 5 percent
Hydric soil rating: No

WKF—Weikert and Klinesville shaly silt loams, steep

Map Unit Setting
National map unit symbol: l3nl
Elevation: 300 to 1,600 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 120 to 217 days
Farmland classification: Not prime farmland

Map Unit Composition
Weikert and similar soils: 40 percent
Klinesville and similar soils: 30 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weikert

Setting
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from shale and siltstone

Typical profile
H1 - 0 to 7 inches: channery silt loam

H2 - 7 to 15 inches: very channery silt loam
H3 - 15 to 19 inches: bedrock

Properties and qualities

Slope: 25 to 75 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Klinesville

Setting

Landform: Valleys, ridges
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from siltstone

Typical profile

H1 - 0 to 7 inches: channery silt loam
H2 - 7 to 11 inches: very channery silt loam
H3 - 11 to 15 inches: very channery silt loam
R - 15 to 19 inches: bedrock

Properties and qualities

Slope: 25 to 75 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Hartleton

Percent of map unit: 10 percent
Landform: — error in exists on —
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Berks

Percent of map unit: 10 percent
Hydric soil rating: No

Leck kill

Percent of map unit: 5 percent
Hydric soil rating: No

Rushtown

Percent of map unit: 5 percent
Hydric soil rating: No

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ATTACHMENT 3
SITE EVALUATION AND SOIL INFILTRATION TEST REPORT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC.
A SUBSIDIARY OF THE WILLIAMS COMPANIES, INC.
POTENTIAL COMPRESSOR STATION 620A PROJECT

SITE EVALUATION AND SOIL INFILTRATION TEST REPORT

1.0 Site Soils

Based upon mapping provided by the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS) Web Soil Survey[1], the project areas under consideration for infiltration BMPs are underlain by Basher silt loam, Calvin shaly silt loam, 8 to 15 percent slopes (CaC), and Leck kill channery silt loam, 8 to 15 percent slopes (LeC) soil series.

Basher silt loam soils consist of flat, moderately well drained soils, found on flood plains. The parent material is loamy alluvium derived from shale and siltstone. Bedrock is typically found at depths of between 42 to 60 inches. Depth to the water table is typically found between 18 to 24 inches.

Calvin shaly silt loam soils consist of gently to moderately sloping, well drained soils, found on hills and summits. The parent material is reddish residuum weathered from shale and siltstone. Bedrock is typically found at depths of between 20 to 40 inches. Depth to the water table is typically more than 80 inches.

Leck kill channery silt loam soils consist of gently to moderately sloping, well drained soils, found on hillslopes and summits. The parent material is reddish residuum derived from sedimentary rock. Bedrock is typically found at depths of between 40 to 80 inches. Depth to the water table is typically more than 80 inches.

The soil infiltration testing described in this section focused on Ba, LaC, and CaC soils. These soils are anticipated as being the primary soils in the areas of possible BMPs.

2.0 Field Investigation and Testing Methodology

BAI completed a total of eleven test pits and eleven double-ring infiltrometer tests; locations were selected to be representative of the main soil series in the areas of potential infiltration BMPs. Figure 1 presents field-located stations of test pits and corresponding double-ring infiltrometer tests.

Five soil test pits (TP-1 through TP-3, and TP-5 through TP-6) were dug by hang on June 24, 2019 to depths of approximately 24 inches to evaluate infiltration rates of shallow soils in the study area. Three soil test pits (TP-4, TP-7, and TP-8) were dug by hand on July 10, 2019 to depths of approximately 24 inches. Lastly three test pits (TP-9 through TP-11) were dug by hand on July 24, 2019 to depths of approximately 24 inches. Five double-ring infiltrometer (DRI) tests were conducted on June 24, 2019 in Testing Area 1, three DRI tests were conducted on July 10 in Testing Area 2, and three DRI tests were completed in Testing Area 3 within each of the test pits completed by BAI. The double-ring infiltration tests consisted of an 11-inch diameter outer ring (OR) and a 4-inch diameter inner ring (IR) set 4-5 inches deep into the bottom of each test pit (approximately 26 inches below grade) to determine infiltration rates of shallow soils at various locations across the site. DRI testing was initiated by completing a one-hour pre-soak, which involved adding six (6) inches of head to both the OR and IR. By noting the drop in head in each infiltrometer at 30 minute increments during the pre-soak, BAI determined that 10-minute testing

[1] http://websoilsurvey.nrcs.usda.gov/app/

intervals for TP-6 and TP-9, and 30-minute testing intervals for the remaining test pits would be used for DRI testing as per the Pennsylvania stormwater Best Management Practices Manual (Document ID 363-0300-002) Appendix C.

Following the pre-soak, all the test pits were refilled to a six (6) inch head level in both the IR and OR. Drop in head was measured from a fixed reference point in the IR every 10 minutes for TP-6 and TP-9; and 30 minutes for the remaining test pits. The IR and OR were refilled following each reading. Results for DRI tests are discussed in Section 3.0, below.

Five soil borings (BH 3 through 7) were completed in April 16, 2020 to characterize soils and identify any limiting zones. The five soil borings were made using hollow stem augurs and split spoons until refusal was encountered. The locations of the bore holes are seen in Figure 1 and results are discussed in Section 3.0.

3.0 Findings and Conclusions

Based upon examination of each test pit, soils beneath the Site in Testing Area 1 consist of dusky red (2.5YR 3/2) silt loam (TP-1 and TP-2) to channery silt loam (TP-3) to a depth of 6 inches. From 6 to 24 inches a reddish brown (2.5YR4/4) silt loam to channery silt loam was observed. A very firm channery silt loam, fragipan was observed in all three test pits at depths ranging from 6 to 8 inches.

The soils beneath the Site in Testing 2 consist of dusky red (2.5YR 3/2) channery silt loam to a depth of 10 inches. From 10 to 24 inches a dark reddish brown (2.5YR 3/4) channery silt loam to gravelly loam (in TP-4) was observed. A very firm channery silt loam, fragipan was observed in all three test pits at depths ranging from 10 to 12 inches.

The soils beneath the Site in Testing 3 consist of dusky red (2.5YR 3/2) channery silt loam to a depth of 10 inches. From 10 to 24 inches a dark reddish brown (2.5YR 3/4) channery silt loam was observed. A very firm channery silt loam, fragipan was observed in all three test pits at depths ranging from 20 to 24 inches.

Lastly, each of the bore holes found had a limiting zone where bedrock was encountered. BH 6 and 7 had the shallowest limiting zone at 9 feet below grade surface. The deepest was found at 22 feet below grade surface in BH 4. No seasonal high water table or water table was encountered at any of the bore holes.

The following tables summarize the DRI readings for each test pit and the limiting zones identified in each bore hole.

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		Infiltration Testing Results								
Hole	Reading Interval	Reading 1 (in.)	Reading 2 (in.)	Reading 3 (in.)	Reading 4 (in.)	Reading 5 (in.)	Reading 6 (in.)	Reading 7 (in.)	Reading 8 (in.)	Infiltration Rate (in./hr)
Testing Area 1										
TP-1	30 min	0.063	0.063	0.063	0.063					**0.125**
TP-2	30 min	0.5	0.5	0.5	0.375					**0.94**
TP-3	30 min	0.25	0.25	0.188	0.188					**0.44**
Testing Area 2										
TP-4	30 min	0.063	0.063	0.063	0.063	0.063				**0.125**
TP-5	30 min	0.063	0.063	0.063	0.063					**0.125**
TP-6	10 min	1.25	0.75	0.75	0.75	0.5	0.5	0.5		**3.38**
TP-7	30 min	0.186	0.125	0.125	0.125					**0.296**
TP-8	30 min	0.5	0.375	0.375	0.375	0.375				**0.75**
Testing Area 3										
TP-9	10 min	0.75	0.5	0.25	0.25	0.125	0.125	0.125	0.125	**0.75**
TP-10	30 min	0.125	0.125	0.063	0.125					**0.22**
TP-11	30 min	0.125	0.125	0.125	0.125					**0.25**

Testing Area 1

TP-1

The infiltration rate within TP-1 was 0.125 inches per hour based upon an average rate of drop of 0.063 inches over the last four 30-minute infiltration readings.

TP-2

The infiltration rate within TP-2 was 0.94 inches per hour based upon an average rate of drop of 0.47 inches over the four 30-minute infiltration readings.

TP-3

The infiltration rate within TP-3 was 0.44 inches per hour based upon an average rate of drop of 0.22 inches over the four 30-minute infiltration readings.

Testing Area 2

TP-4

The infiltration rate within TP-4 was 0.125 inches per hour based upon an average rate of drop of 0.063 inches over the last four 30-minute infiltration readings.

TP-5

The infiltration rate within TP-5 was 0.125 inches per hour based upon an average rate of drop of 0.063 inches over the four 30-minute infiltration readings.

TP-6

The infiltration rate within TP-6 was 3.38 inches per hour based upon an average rate of drop of 0.563 inches over the last four 10-minute infiltration readings.

TP-7

The infiltration rate within TP-6 was 0.296 inches per hour based upon an average rate of drop of 0.148 inches over the four 30-minute infiltration readings.

TP-8

The infiltration rate within TP-6 was 0.75 inches per hour based upon an average rate of drop of 0.375 inches over the four 30-minute infiltration readings.

Testing Area 3

TP-9

The infiltration rate within TP-9 was 0.75 inches per hour based upon an average rate of drop of 0.125 inches over the last four 10-minute infiltration readings.

TP-10

The infiltration rate within TP-10 was 0.22 inches per hour based upon an average rate of drop of 0.11 inches over the four 30-minute infiltration readings.

TP-11

The infiltration rate within TP-11 was 0.25 inches per hour based upon an average rate of drop of 0.125 inches over the four 30-minute infiltration readings.

Limiting Zone Investigation Results				
Test Pit/Boring	Seasonal High Water Table (ft)	Water Table (ft)	Bedrock (ft)	Total Depth (ft)
BH 3	Not Encountered	Not Encountered	15	15
BH 4	Not Encountered	Not Encountered	22	22
BH 5	Not Encountered	Not Encountered	12	12
BH 6	Not Encountered	Not Encountered	9	9
BH 7	Not Encountered	Not Encountered	9	9

Average Site Infiltration Rate and Discussion

Based upon the results of double-ring infiltration testing completed by BAI, the overall average infiltration rate at Testing Area 1 within Ba and LeC soils was 0.502 inches per hour. We feel these rates are representative of the infiltration rate for the Ba and LeC soils at depths up to 28 inches within the potential infiltration BMP in this testing area.

In Testing Area 2 soils, the average infiltration rate in the CaC soils was 0.935. We feel this rate may be slightly inflated due to the outlier infiltration rate exhibited at TP-6; 3.3 inches per hour. We feel that the average of the remaining four test pits, 0.734 inches per hour, is the most representative of CaC soils within the potential BMP area at Testing Area 2.

Lastly, the overall average infiltration rate within the Testing Area 3 within LeC soils was 0.41 inches per hour. We feel this rate is representative of the infiltration rate for the LeC soils at depths up to 28 inches, within the potential infiltration BMP location at Testing Area 3.

References

Pennsylvania Department of Environmental Protection. "Pennsylvania Stormwater Best Management Practices Manual" Document No. 363-0300-02, December 2006.

"Web Soil Survey - Home." Web Soil Survey - Home. United States Department of Agriculture, 6 Dec. 2013. Web. 1 June 2019. <http://websoilsurvey.nrcs.usda.gov/app/>.

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INFILTRATION TEST FORM

Project Name: Potential Compressor Station 620A Date: 6/24/2019 Test Completed By: Tony Moscatello

Weather Conditions: Partly Cloudy to Sunny /High 70s Soil Conditions: Damp in most areas

Hole No.	Prewet 1 (Drop In.)	Prewet 2 (Drop In.)	Interval Time	Reading No. 1 (Drop In.)	Reading No. 2 (Drop In.)	Reading No. 3 (Drop In.)	Reading No. 4: (Drop In.)	Reading No. 5: (Drop In.)	Reading No. 6: (Drop In.)	Reading No. 7: (Drop In.)	Reading No. 8: (Drop In.)	Average (Drop In.)
TP-1	0.063	0.063	30 min	0.063	0.063	0.063	0.063					**0.063**
TP-2	0.938	0.875	30 min	0.5	0.5	0.5	0.375					**0.47**
TP-3	1.25	0.75	30 min	0.25	0.25	0.188	0.188					**0.22**
TP-5	0.125	0.063	30 min	0.063	0.063	0.063	0.063					**0.063**
TP-6	>2.0	>2.0	10 min	1.25	0.75	0.75	0.75	0.5	0.5	0.5		**0.563**

Notes: Hand dug test pits to 24 inches in depth. Located on land that was being used for agricultural purposes. Corn was being grown, at time of testing, in areas of TP-1 through TP-3. Grasses were growing at time of testing in the areas of TP-5 through TP-6. 0-6”

For TP-1 through TP-3 Areas: Silt loam to channery silt loam (2.5YR 3/2) from 0-6” and silt loam to channery silt loam (2.5YR 4/4) from 6-24”. Fragipan at 6” in these testing areas. Very hard, compact. Wetlands located west and southwest of testing areas. Topsoils were eroded away in areas around these test pits due to uncontrolled stormwater runoff.

For TP-5 through TP-6 Areas: Channery silt loam (2.5YR 3/2) from 0-10” and channery silt loam (2.5YR 4/4) from 10-24”. Fragipan located at a depth between 10 and 12” in these testing areas. Very hard, compact. Test pits located in swale created by landowner/landuser.

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POTENTIAL COMPRESSOR STATION 620A PROJECT

INFILTRATION TEST FORM

Project Name: Potential Compressor Station 620A Date: 7/10/2019 Test Completed By: Tony Moscatello

Weather Conditions: Sunny/Low80s Soil Conditions: Damp in most areas

Hole No.	Prewet 1 (Drop In.)	Prewet 2 (Drop In.)	Interval Time	Reading No. 1 (Drop In.)	Reading No. 2 (Drop In.)	Reading No. 3 (Drop In.)	Reading No. 4: (Drop In.)	Reading No. 5: (Drop In.)	Reading No. 6: (Drop In.)	Reading No. 7: (Drop In.)	Reading No. 8: (Drop In.)	Average (Drop In.)
TP-4	0.125	0.125	30 min	0.063	0.063	0.063	0.063	0.063				**0.063**
TP-7	1.0	0.75	30 min	0.186	0.125	0.125	0.125					**0.148**
TP-8	1.5	0.5	30 min	0.5	0.375	0.375	0.375	0.375				**0.375**

Notes: Hand dug test pits to 24 inches in depth. Located on land that was being used for agricultural purposes. Only grasses were growing at time of testing. 0-18” Channery silt loam (2.5YR 3/2). 11-24” Channery silt loam to gravelly loam (2.5YR 4/4). Fragipan at 10-12” in areas tested. Very hard, compact. Very shallow bedrock west of TP-4. Encountered weathered bedrock at approximate 10-14” when attempting to dig pits west of TP-4.

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POTENTIAL COMPRESSOR STATION 620A PROJECT

INFILTRATION TEST FORM

Project Name: Potential Compressor Station 620A Date: 7/24/2019 Test Completed By: Tony Moscatello

Weather Conditions: Sunny/80s Soil Conditions: Damp in most areas

Hole No.	Prewet 1 (Drop In.)	Prewet 2 (Drop In.)	Interval Time	Reading No. 1 (Drop In.)	Reading No. 2 (Drop In.)	Reading No. 3 (Drop In.)	Reading No. 4: (Drop In.)	Reading No. 5: (Drop In.)	Reading No. 6: (Drop In.)	Reading No. 7: (Drop In.)	Reading No. 8: (Drop In.)	Average (Drop In.)
TP-9	>2.0	>2.0	10 min	0.75	0.5	0.25	0.25	0.125	0.125	0.125	0.125	**0.125**
TP-10	0.5	0.25	30 min	0.125	0.125	0.063	0.125					**0.11**
TP-11	0.25	0.125	30 min	0.125	0.125	0.125	0.125					**0.125**

Notes: Hand dug test pits to 24 inches in depth. Located on land that was being used for agricultural purposes. Only grasses were growing at time of testing. 0-11” Channery silt loam (2.5YR 3/2). 11-24” Channery silt loam (2.5YR 3/4). Fragipan at 20-24” in areas tested. Very hard, compact. Steep slope south of area due to shallow bedrock. Hand auger holes completed east of testing area also encounter fragipan at depths of approximately 24”.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH - COMPRESSOR STATION 620

SOIL TEST PIT LOCATIONS

CLINTON COUNTY

PENNSYLVANIA

Date:	05/21/20
WHM DRAWING NUMBER:	WILLIAMS206B001
Drawn By:	BWH
Figure Number:	1

ATTACHMENT 4

PCSM PLAN BMP DESIGN WORKSHEETS AND CALCULATIONS

TABLE OF CONTENTS

Attachment *(Revised May 2020)*

4.1 Stormwater BMP Manual Appendix D Worksheets

4.2 Channel Design Worksheets (Standard E&S Worksheet #11)

4.3 Outlet Basin Design Worksheet

4.4 RipRap Apron Worksheet

4.5 Culvert Schedule

4.6 HydroCAD Report

ATTACHMENT 4.1

STORMWATER BMP MANUAL APPENDIX D WORKSHEETS

Appendix D. Worksheets- Compressor Station 620

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 7/12/2019

Project Name: Leidy South – Compressor Station 620

Municipality: Township of Hegins

County: Schuylkill

Total Area (acres): 8.91

Major River Basin: Susquehanna River

Watershed: Pine Creek

Sub-Basin: Deep Creek

Nearest Surface Water(s) to Receive Runoff: Deep Creek

Chapter 93 – Designated Water Use/Existing Water Use: CWF, MF

Impaired according to Category 4 or 5 of the Integrated Water Quality Monitoring and Assessment Report? Yes ☐ No ☒

List Causes of Impairment: A

Is there an established TMDL that applies: Yes ☐ No ☒

Total Maximum Daily Loads (TMDLS)

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☒

Existing or planned drinking water supply? Yes ☐ No ☒

If yes, distance from proposed discharge (miles):

Approved Act 167 Plan? Yes ☐ No ☒

Existing River Conservation Plan? Yes ☐ No ☒

Worksheet 2. Sensitive Natural Resources from PA Stormwater Best Management Practices Chapter 5

INSTRUCTIONS

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	n/a		
Floodplains	n/a		
Riparian Areas	n/a		
Wetlands	n/a		
Woodlands	n/a		
Natural Drainage Ways	n/a		
Steep Slopes, 15% - 25%	n/a		
Steep Slopes, over 25%	n/a		
Other:			
Other:			
TOTAL EXISTING:		**0**	**0**

Worksheet 3. Nonstructural BMP Credits from PA Stormwater Best Management Practices Manual (SW BMP Manual)

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) _____ **Ac.**

1.2 Area of Riparian Forest Buffer Protection (see WS 2) _____ **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading (See Chapter 8, page 21 – SW BMP Manual) _____ **Ac**

TOTAL 0 **Ac**

Site Area	Minus	Protected Area	=	Stormwater Management Area
8.91	-	0	=	8.91

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction (See Chapter 8, page 22 – SW BMP Manual)

Lawn _____ ft^2 x 1/4" x 1/12 = _____ ft^3

_____

Meadow _____ ft^2 x 1/3" x 1/12 = _____ ft^3

3.3 Protect Existing Trees (See Chapter 8, page 23 – SW BMP Manual)

For Trees within 100 feet of impervious area:

Tree Canopy _____ ft^2 x 1/2" x 1/12 = _____ ft^3

_____ _____

5.1 Disconnect Roof Leaders to Vegetated Areas (See Chapter 8 page 25 – SW BMP Manual)

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Roof Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

5.2 Disconnect Non-Roof impervious to Vegetated Areas (See Chapter 8, page 26 – SW BMP Manual)

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Impervious Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

TOTAL NON-STRUCTURAL VOLUME CREDIT* _____ ft

**For use on Worksheet 5*

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Leidy South – Compressor Station 607
Drainage Area: 45.3 acres
2-Year Rainfall: 3.12 in

Total Site Area: 45.3 acres
Protected Site Area: 0 acres
Managed Area: 45.3 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Meadow	LeB/C	1,014,006	23.28	30	23.33	4.67	0.11	9,278
Meadow	CaB/C	959,232	22.02	58	7.24	1.45	0.31	25,064
TOTAL:		1,973,238	45.30				0.42	34,342

Developed Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Impervious	LeB/C	145,364	3.34	89	1.24	0.25	2.01	24,332
Meadow	CaB/C	868,624	19.94	30	23.33	4.67	0.11	7,948
Impervious	LeB/C	21,382	0.49	89	1.24	0.25	2.01	3,579
Meadow	CaB/C	937,850	21.53	58	7.24	1.45	0.31	24,505
TOTAL:		1,973,268	45.30				4.44	60,364

2-Year Volume Increase (ft3): 26,022

2-Year Volume Increase = Developed Conditions Runoff Volume – Existing Conditions Runoff Volume

1. Runoff (in) = Q = $(P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 5. Structural BMP Volume Credits

PROJECT: Leidy South – Compressor Station 620
SUB-BASIN: Deep Creek Subbasin

Required Control Volume (ft^3) – *from Worksheet 4*: 26,022

Non-structural Volume Credit (ft^3) – *from Worksheet 3*: - 0
(maximum is 25% of required volume)

Structural Volume Reqmt (ft^3) 26,022

(Required Control Volume minus Non-structural Credit)

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 6		Area (ft^2)	Volume Reduction Permanently Removed (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale	1,440	9,391
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin	10,380	53,149
6.7.1	Riparian Buffer/Riparian Forest Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): 63,529
Structural Volume Requirement (ft^3): 26,022
DIFFERENCE -37,507

Stormwater BMP Manual Appendix D. Worksheets
Compressor Station 620

Worksheet 10 – Water Quality Compliance for Nitrate		
Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the equivalent) "provided across the site" is taken to mean the specifications for that BMP set forward in Sections 5 and 6 are satisfied. Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 5 & 6		
	Yes	**No**
Primary BMPs for Nitrate:	☐	☐
NS BMP 5.4.2 – Protect/Conserve/Enhance Riparian Buffers	☐	☐
NS BMP 5.5.4 – Cluster Uses at Each Site	☐	☐
NS BMP 5.6.1 – Minimize Total Disturbed Area	☒	☐
NS BMP 5.6.3 – Re-Vegetate/Re-Forest Disturbed Areas (Native Species)	☒	☐
NS BMP 5.9.1 – Street Sweeping/Vacuuming	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☒	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
	☐	☐
Secondary BMPs for Nitrate:	☐	☐
NS BMP 5.4.1 – Protect Sensitive/Special Value Features	☐	☐
NS BMP 5.4.3 – Protect/Utilize Natural Drainage Features	☐	☐
NS BMP 5.6.2 – Minimize Soil Compaction	☐	☐
Structural BMP 6.4.5 – Rain Garden/Bioretention	☐	☐
Structural BMP 6.4.8 – Vegetated Swale	☒	☐
Structural BMP 6.4.9 – Vegetated Filter Strip	☐	☐
Structural BMP 6.6.1 – Constructed Wetland	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☒	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
Structural BMP 6.7.3 – Soil Amendment/Restoration	☐	☐

ATTACHMENT 4.2
CHANNEL DESIGN WORKSHEETS

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South-Compressor Station 620 Collection Channels

Prepared by: FPV,5/2020

LOCATION: HeginsTownship, Schuylkill County, Pennsylvania

Checked by: KCC, 5/2020

CHANNEL OR CHANNEL SECTION		#1	#1	#2	#2	#3	#3
TEMPORARY OR PERMANENT?	(T OR P)	P	P	P	P	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 YR	10 YR	10 YR	10 YR	10 YR	10 YR
ACRES	(AC)	2.14	2.14	2.14	2.14	2.10	2.10
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	1.98	1.98	1.98	1.98	1.12	1.12
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.41	2.51	2.41	2.51	1.43	1.49
PROTECTIVE LINING[2]		ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM
n (MANNING'S COEFFICIENT)[2]		0.040	0.058	0.040	0.058	0.040	0.058
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15.0	9.5	15.0	9.5	15.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.1	1.7	2.1	1.7	1.3	1.0
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.5	8.0	2.5	8.0	2.5	8.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.4	0.5	0.4	0.5	0.1	0.2
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.00	1.00	1.00	1.00	1.00	1.00
CHANNEL TOP WIDTH @ D	(FT)	6.00	6.00	6.00	6.00	6.00	6.00
d (CALCULATED FLOW DEPTH)	(FT)	0.40	0.50	0.40	0.50	0.40	0.50
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.60	4.00	3.60	4.00	3.60	4.00
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	5.00	4.00	5.00	4.00	5.00	4.00
d_{50} STONE SIZE	(IN)	--	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.120	1.500	1.120	1.500	1.120	1.500
R (HYDRAULIC RADIUS)		0.296	0.354	0.296	0.354	0.296	0.354
S (BED SLOPE)[3]	(FT/FT)	0.017	0.017	0.017	0.017	0.006	0.006
S_c (CRITICAL SLOPE)	(FT/FT)	0.037	0.073	0.037	0.073	0.037	0.073
$.7S_c$	(FT/FT)	0.026	0.051	0.026	0.051	0.026	0.051
$1.3S_c$	(FT/FT)	0.048	0.095	0.048	0.095	0.048	0.095
STABLE FLOW?	(Y/N)	Y	Y	Y	Y	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	--	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.1	0.1	0.1	0.1	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

* Due to PADEP Stormwater BMP design requirements for vegetated swales, the bottom width:flow depth ratio is above 12:1 max for each scenario for the 10-yr storm event.

CHANNEL OR CHANNEL SECTION		#4	#4	#5	#5	#6	#6
TEMPORARY OR PERMANENT?	(T OR P)	P	P	P	P	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 YR	10 YR	10 YR	10 YR	10 YR	10 YR
ACRES	(AC)	0.78	0.78	0.16	0.16	0.49	0.49
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	0.00	0.00	0.51	0.51	0.57	0.57
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	0.54	0.37	0.85	0.59	1.63	1.12
PROTECTIVE LINING[2]		ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM
n (MANNING'S COEFFICIENT)[2]		0.040	0.058	0.040	0.058	0.040	0.058
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15.0	9.5	15.0	9.5	15.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.1	0.8	1.8	1.2	2.1	1.4
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.5	8.0	2.5	8.0	2.5	8.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.1	0.1	0.3	0.3	0.4	0.4
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	3	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	0.75	0.75	0.75	0.75	1.00	1.00
CHANNEL TOP WIDTH @ D	(FT)	5.00	5.00	5.00	5.00	6.00	6.00
d (CALCULATED FLOW DEPTH)	(FT)	0.20	0.20	0.20	0.20	0.30	0.30
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.80	2.80	2.80	2.80	3.20	3.20
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	10.00	10.00	10.00	10.00	6.67	6.67
d_{50} STONE SIZE	(IN)	--	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.48	0.48	0.48	0.48	0.78	0.78
R (HYDRAULIC RADIUS)		0.166	0.166	0.166	0.166	0.233	0.233
S (BED SLOPE)[3]	(FT/FT)	0.010	0.010	0.025	0.025	0.022	0.022
S_c (CRITICAL SLOPE)	(FT/FT)	0.044	0.092	0.044	0.092	0.039	0.083
$.7S_c$	(FT/FT)	0.031	0.064	0.031	0.064	0.028	0.058
$1.3S_c$	(FT/FT)	0.057	0.120	0.057	0.120	0.051	0.108
STABLE FLOW?	(Y/N)	Y	Y	Y	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	--	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.05	0.05	0.05	0.05	0.07	0.07
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

* Due to PADEP Stormwater BMP design requirements for vegetated swales, the bottom width:flow depth ratio is above 12:1 max for each scenario for the 10-yr storm event.

CHANNEL OR CHANNEL SECTION		#7	#7	#8	#8	#9	#9
TEMPORARY OR PERMANENT?	(T OR P)	P	P	P	P	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 YR	10 YR	10 YR	10 YR	10 YR	10 YR
ACRES	(AC)	0.11	0.11	1.23	1.23	2.79	2.79
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	3.62	3.62	3.59	3.59	0.00	0.00
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	4.14	4.03	5.29	3.65	0.37	0.25
PROTECTIVE LINING[2]		ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM
n (MANNING'S COEFFICIENT)[2]		0.040	0.058	0.040	0.058	0.040	0.058
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15.0	9.5	15.0	9.5	15.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.8	2.1	3.5	2.4	1.7	1.1
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.5	8.0	2.5	8.0	2.5	8.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.7	0.8	1.1	1.1	0.3	0.3
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.00	1.25	1.00	1.00	0.75	0.75
CHANNEL TOP WIDTH @ D	(FT)	6.00	7.00	6.00	6.00	5.00	5.00
d (CALCULATED FLOW DEPTH)	(FT)	0.50	0.60	0.50	0.50	0.10	0.10
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.00	4.40	4.00	4.00	2.40	2.40
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	4.00	3.33	4.00	4.00	20.00	20.00
d_{50} STONE SIZE	(IN)	--	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.500	1.920	1.500	1.500	0.220	0.220
R (HYDRAULIC RADIUS)		0.354	0.410	0.354	0.354	0.090	0.090
S (BED SLOPE)[3]	(FT/FT)	0.022	0.022	0.036	0.036	0.050	0.050
S_c (CRITICAL SLOPE)	(FT/FT)	0.035	0.070	0.035	0.073	0.053	0.111
$.7S_c$	(FT/FT)	0.024	0.049	0.024	0.051	0.037	0.078
$1.3S_c$	(FT/FT)	0.045	0.091	0.045	0.095	0.069	0.145
STABLE FLOW?	(Y/N)	Y	Y	N	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	0.1	--	0.01	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.15	--	0.1	--	0.02
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

* Due to PADEP Stormwater BMP design requirements for vegetated swales, the bottom width:flow depth ratio is above 12:1 max for each scenario for the 10-yr storm event.

CHANNEL OR CHANNEL SECTION		#10	#10	#11	#11	#12	#12
TEMPORARY OR PERMANENT?	(T OR P)	P	P	P	P	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 YR	10 YR	10 YR	10 YR	10 YR	10 YR
ACRES	(AC)	2.87	2.87	2.20	2.20	0.71	0.71
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	0.22	0.22	0.08	0.08	3.60	3.60
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.86	2.98	0.87	0.60	4.50	4.38
PROTECTIVE LINING[2]		ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM	ECM (SC250)	Vegetated ECM
n (MANNING'S COEFFICIENT)[2]		0.040	0.058	0.040	0.058	0.040	0.058
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15.0	9.5	15.0	9.5	15.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.6	2.0	1.8	1.2	3.0	2.3
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.5	8.0	2.5	8.0	2.5	8.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.6	0.7	0.3	0.3	0.8	1.0
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.00	1.00	0.75	0.75	1.00	1.25
CHANNEL TOP WIDTH @ D	(FT)	6.00	6.00	5.00	5.00	6.00	7..00
d (CALCULATED FLOW DEPTH)	(FT)	0.40	0.50	0.20	0.20	0.50	0.60
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.60	4.00	2.80	2.80	4.00	4.40
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	5.00	4.00	10.00	10.00	4.00	3.33
d_{50} STONE SIZE	(IN)	--	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.120	1.500	0.480	0.480	1.500	1.920
R (HYDRAULIC RADIUS)		0.296	0.354	0.166	0.166	0.354	0.410
S (BED SLOPE)[3]	(FT/FT)	0.024	0.024	0.026	0.026	0.026	0.026
S_c (CRITICAL SLOPE)	(FT/FT)	0.037	0.073	0.044	0.092	0.035	0.070
$.7S_c$	(FT/FT)	0.026	0.051	0.031	0.064	0.024	0.049
$1.3S_c$	(FT/FT)	0.048	0.095	0.057	0.120	0.045	0.091
STABLE FLOW?	(Y/N)	Y	Y	Y	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	--	0.1	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.1	0.1	0.1	--	0.15
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

* Due to PADEP Stormwater BMP design requirements for vegetated swales, the bottom width:flow depth ratio is above 12:1 max for each scenario for the 10-yr storm event.

HYDROCAD CHANNEL PEAK FLOW CALCULATIONS

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.402	30	Meadow, non-grazed, HSG A (DA1, DA3, DA4b)
0.127	58	Meadow, non-grazed, HSG B (DA4b)
0.834	98	Paved parking, HSG A (DA1)
0.660	98	Paved parking, HSG B (DA4b)
5.023	**51**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.236	HSG A	DA1, DA3, DA4b
0.787	HSG B	DA4b
0.000	HSG C	
0.000	HSG D	
0.000	Other	
5.023		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.402	0.127	0.000	0.000	0.000	3.529	Meadow, non-grazed	DA1, DA3, DA4b
0.834	0.660	0.000	0.000	0.000	1.494	Paved parking	DA1, DA4b
4.236	**0.787**	**0.000**	**0.000**	**0.000**	**5.023**	**TOTAL AREA**	

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA1: CC1 AND CC2 Runoff Area=93,523 sf 38.84% Impervious Runoff Depth=0.81"
Flow Length=549' Tc=12.5 min CN=56 Runoff=1.98 cfs 0.145 af

Subcatchment DA3: CC4 Runoff Area=33,792 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=278' Tc=7.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment DA4b: CC3 Runoff Area=91,476 sf 31.42% Impervious Runoff Depth=0.65"
Flow Length=866' Tc=17.8 min CN=53 Runoff=1.12 cfs 0.114 af

Total Runoff Area = 5.023 ac Runoff Volume = 0.259 af Average Runoff Depth = 0.62"
70.26% Pervious = 3.529 ac 29.74% Impervious = 1.494 ac

Summary for Subcatchment DA1: CC1 AND CC2

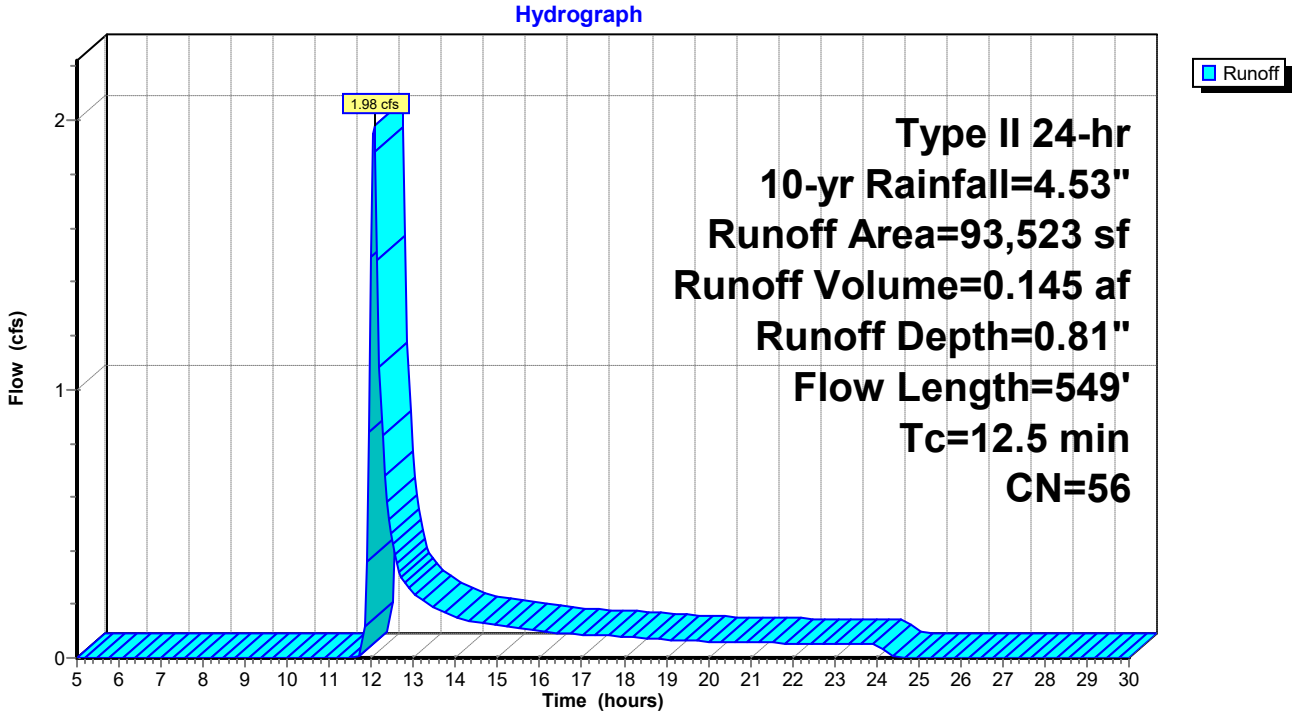
Runoff = 1.98 cfs @ 12.07 hrs, Volume= 0.145 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
36,329	98	Paved parking, HSG A
57,194	30	Meadow, non-grazed, HSG A
93,523	56	Weighted Average
57,194		61.16% Pervious Area
36,329		38.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	89	0.0450	1.84		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.12"
11.7	460	0.0173	0.66	0.98	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
12.5	549	Total			

Subcatchment DA1: CC1 AND CC2



Hydrograph for Subcatchment DA1: CC1 AND CC2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	0.00	0.00	17.75	4.15	0.64	0.08
5.25	0.30	0.00	0.00	18.00	4.17	0.65	0.08
5.50	0.32	0.00	0.00	18.25	4.19	0.66	0.08
5.75	0.34	0.00	0.00	18.50	4.21	0.66	0.07
6.00	0.36	0.00	0.00	18.75	4.23	0.67	0.07
6.25	0.38	0.00	0.00	19.00	4.25	0.68	0.07
6.50	0.40	0.00	0.00	19.25	4.27	0.69	0.07
6.75	0.43	0.00	0.00	19.50	4.28	0.70	0.06
7.00	0.45	0.00	0.00	19.75	4.30	0.70	0.06
7.25	0.47	0.00	0.00	20.00	4.31	0.71	0.06
7.50	0.49	0.00	0.00	20.25	4.33	0.72	0.06
7.75	0.52	0.00	0.00	20.50	4.34	0.72	0.06
8.00	0.54	0.00	0.00	20.75	4.36	0.73	0.06
8.25	0.57	0.00	0.00	21.00	4.37	0.74	0.06
8.50	0.60	0.00	0.00	21.25	4.38	0.74	0.06
8.75	0.63	0.00	0.00	21.50	4.40	0.75	0.06
9.00	0.67	0.00	0.00	21.75	4.41	0.75	0.06
9.25	0.70	0.00	0.00	22.00	4.43	0.76	0.05
9.50	0.74	0.00	0.00	22.25	4.44	0.77	0.05
9.75	0.78	0.00	0.00	22.50	4.45	0.77	0.05
10.00	0.82	0.00	0.00	22.75	4.47	0.78	0.05
10.25	0.87	0.00	0.00	23.00	4.48	0.79	0.05
10.50	0.92	0.00	0.00	23.25	4.49	0.79	0.05
10.75	0.99	0.00	0.00	23.50	4.50	0.80	0.05
11.00	1.06	0.00	0.00	23.75	4.52	0.80	0.05
11.25	1.16	0.00	0.00	24.00	**4.53**	**0.81**	0.05
11.50	1.28	0.00	0.00	24.25	4.53	0.81	0.01
11.75	1.75	0.00	0.00	24.50	4.53	0.81	0.00
12.00	3.00	0.22	**1.49**	24.75	4.53	0.81	0.00
12.25	3.20	0.28	**0.83**	25.00	4.53	0.81	0.00
12.50	3.33	0.32	0.42	25.25	4.53	0.81	0.00
12.75	3.42	0.35	0.29	25.50	4.53	0.81	0.00
13.00	3.50	0.38	0.24	25.75	4.53	0.81	0.00
13.25	3.56	0.40	0.21	26.00	4.53	0.81	0.00
13.50	3.62	0.42	0.19	26.25	4.53	0.81	0.00
13.75	3.67	0.44	0.17	26.50	4.53	0.81	0.00
14.00	3.71	0.46	0.15	26.75	4.53	0.81	0.00
14.25	3.76	0.48	0.14	27.00	4.53	0.81	0.00
14.50	3.79	0.49	0.13	27.25	4.53	0.81	0.00
14.75	3.83	0.50	0.13	27.50	4.53	0.81	0.00
15.00	3.87	0.52	0.12	27.75	4.53	0.81	0.00
15.25	3.90	0.53	0.12	28.00	4.53	0.81	0.00
15.50	3.93	0.54	0.11	28.25	4.53	0.81	0.00
15.75	3.96	0.56	0.10	28.50	4.53	0.81	0.00
16.00	3.99	0.57	0.10	28.75	4.53	0.81	0.00
16.25	4.01	0.58	0.09	29.00	4.53	0.81	0.00
16.50	4.04	0.59	0.09	29.25	4.53	0.81	0.00
16.75	4.06	0.60	0.09	29.50	4.53	0.81	0.00
17.00	4.08	0.61	0.09	29.75	4.53	0.81	0.00
17.25	4.11	0.62	0.09	30.00	4.53	0.81	0.00
17.50	4.13	0.63	0.08				

Summary for Subcatchment DA3: CC4

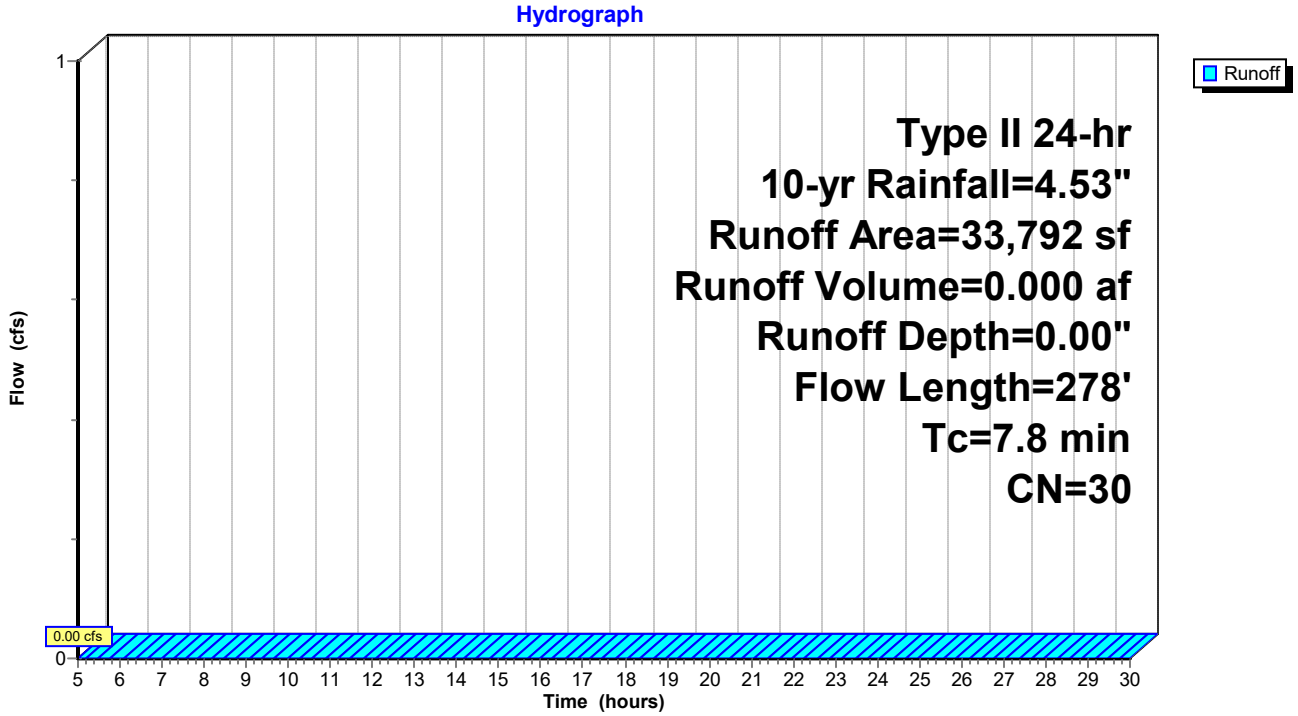
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
33,792	30	Meadow, non-grazed, HSG A
33,792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	100	0.0650	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
1.3	169	0.0180	2.16		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	9	0.0100	0.50	0.75	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
7.8	278	Total			

Subcatchment DA3: CC4



Hydrograph for Subcatchment DA3: CC4

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	**0.00**	**0.00**	17.75	4.15	0.00	0.00
5.25	0.30	0.00	0.00	18.00	4.17	0.00	0.00
5.50	0.32	0.00	0.00	18.25	4.19	0.00	0.00
5.75	0.34	0.00	0.00	18.50	4.21	0.00	0.00
6.00	0.36	0.00	0.00	18.75	4.23	0.00	0.00
6.25	0.38	0.00	0.00	19.00	4.25	0.00	0.00
6.50	0.40	0.00	0.00	19.25	4.27	0.00	0.00
6.75	0.43	0.00	0.00	19.50	4.28	0.00	0.00
7.00	0.45	0.00	0.00	19.75	4.30	0.00	0.00
7.25	0.47	0.00	0.00	20.00	4.31	0.00	0.00
7.50	0.49	0.00	0.00	20.25	4.33	0.00	0.00
7.75	0.52	0.00	0.00	20.50	4.34	0.00	0.00
8.00	0.54	0.00	0.00	20.75	4.36	0.00	0.00
8.25	0.57	0.00	0.00	21.00	4.37	0.00	0.00
8.50	0.60	0.00	0.00	21.25	4.38	0.00	0.00
8.75	0.63	0.00	0.00	21.50	4.40	0.00	0.00
9.00	0.67	0.00	0.00	21.75	4.41	0.00	0.00
9.25	0.70	0.00	0.00	22.00	4.43	0.00	0.00
9.50	0.74	0.00	0.00	22.25	4.44	0.00	0.00
9.75	0.78	0.00	0.00	22.50	4.45	0.00	0.00
10.00	0.82	0.00	0.00	22.75	4.47	0.00	0.00
10.25	0.87	0.00	0.00	23.00	4.48	0.00	0.00
10.50	0.92	0.00	0.00	23.25	4.49	0.00	0.00
10.75	0.99	0.00	0.00	23.50	4.50	0.00	0.00
11.00	1.06	0.00	0.00	23.75	4.52	0.00	0.00
11.25	1.16	0.00	0.00	24.00	**4.53**	0.00	0.00
11.50	1.28	0.00	0.00	24.25	4.53	0.00	0.00
11.75	1.75	0.00	0.00	24.50	4.53	0.00	0.00
12.00	3.00	0.00	0.00	24.75	4.53	0.00	0.00
12.25	3.20	0.00	0.00	25.00	4.53	0.00	0.00
12.50	3.33	0.00	0.00	25.25	4.53	0.00	0.00
12.75	3.42	0.00	0.00	25.50	4.53	0.00	0.00
13.00	3.50	0.00	0.00	25.75	4.53	0.00	0.00
13.25	3.56	0.00	0.00	26.00	4.53	0.00	0.00
13.50	3.62	0.00	0.00	26.25	4.53	0.00	0.00
13.75	3.67	0.00	0.00	26.50	4.53	0.00	0.00
14.00	3.71	0.00	0.00	26.75	4.53	0.00	0.00
14.25	3.76	0.00	0.00	27.00	4.53	0.00	0.00
14.50	3.79	0.00	0.00	27.25	4.53	0.00	0.00
14.75	3.83	0.00	0.00	27.50	4.53	0.00	0.00
15.00	3.87	0.00	0.00	27.75	4.53	0.00	0.00
15.25	3.90	0.00	0.00	28.00	4.53	0.00	0.00
15.50	3.93	0.00	0.00	28.25	4.53	0.00	0.00
15.75	3.96	0.00	0.00	28.50	4.53	0.00	0.00
16.00	3.99	0.00	0.00	28.75	4.53	0.00	0.00
16.25	4.01	0.00	0.00	29.00	4.53	0.00	0.00
16.50	4.04	0.00	0.00	29.25	4.53	0.00	0.00
16.75	4.06	0.00	0.00	29.50	4.53	0.00	0.00
17.00	4.08	0.00	0.00	29.75	4.53	0.00	0.00
17.25	4.11	0.00	0.00	30.00	4.53	0.00	0.00
17.50	4.13	0.00	0.00				

Summary for Subcatchment DA4b: CC3

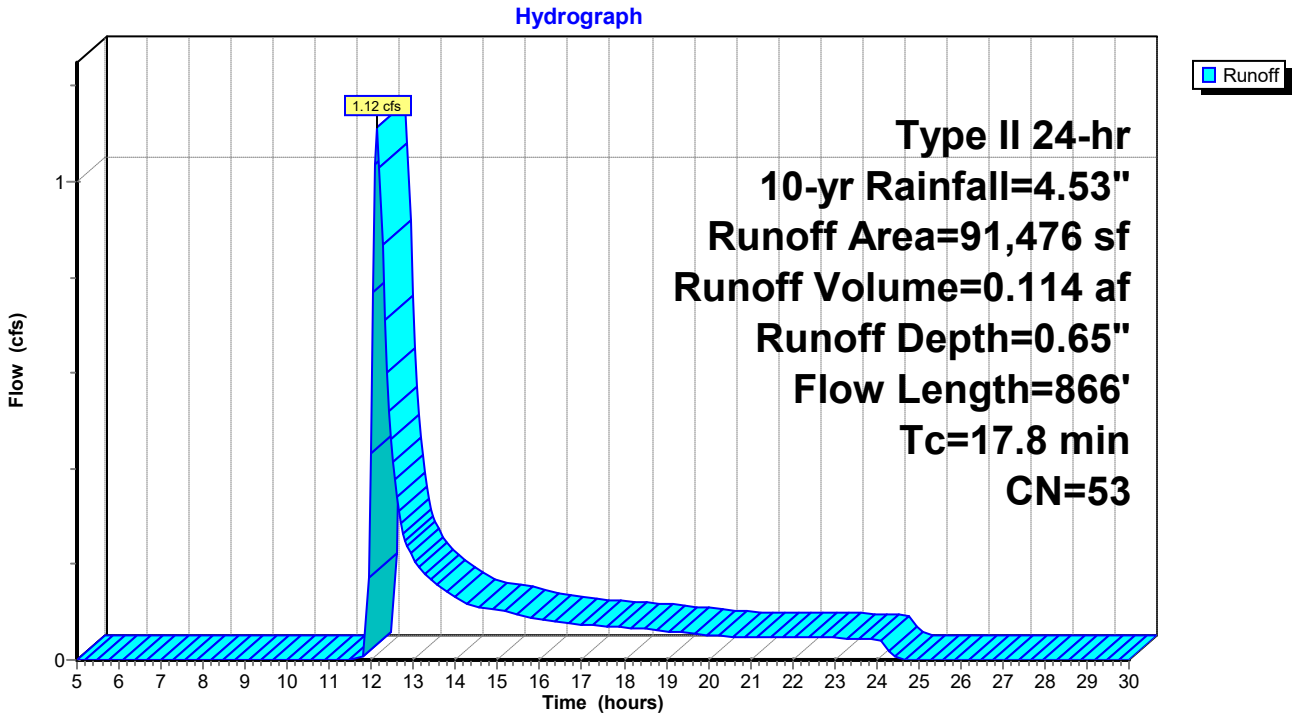
Runoff = 1.12 cfs @ 12.15 hrs, Volume= 0.114 af, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
28,739	98	Paved parking, HSG B
57,190	30	Meadow, non-grazed, HSG A
5,547	58	Meadow, non-grazed, HSG B
91,476	53	Weighted Average
62,737		68.58% Pervious Area
28,739		31.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.36		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.12"
1.5	253	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	190	0.0290	2.74		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13.9	323	0.0060	0.39	0.58	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
17.8	866	Total			

Subcatchment DA4b: CC3



Hydrograph for Subcatchment DA4b: CC3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	0.00	0.00	17.75	4.15	0.50	0.07
5.25	0.30	0.00	0.00	18.00	4.17	0.51	0.07
5.50	0.32	0.00	0.00	18.25	4.19	0.52	0.07
5.75	0.34	0.00	0.00	18.50	4.21	0.53	0.06
6.00	0.36	0.00	0.00	18.75	4.23	0.53	0.06
6.25	0.38	0.00	0.00	19.00	4.25	0.54	0.06
6.50	0.40	0.00	0.00	19.25	4.27	0.55	0.06
6.75	0.43	0.00	0.00	19.50	4.28	0.55	0.06
7.00	0.45	0.00	0.00	19.75	4.30	0.56	0.05
7.25	0.47	0.00	0.00	20.00	4.31	0.57	0.05
7.50	0.49	0.00	0.00	20.25	4.33	0.57	0.05
7.75	0.52	0.00	0.00	20.50	4.34	0.58	0.05
8.00	0.54	0.00	0.00	20.75	4.36	0.58	0.05
8.25	0.57	0.00	0.00	21.00	4.37	0.59	0.05
8.50	0.60	0.00	0.00	21.25	4.38	0.59	0.05
8.75	0.63	0.00	0.00	21.50	4.40	0.60	0.05
9.00	0.67	0.00	0.00	21.75	4.41	0.61	0.05
9.25	0.70	0.00	0.00	22.00	4.43	0.61	0.05
9.50	0.74	0.00	0.00	22.25	4.44	0.62	0.05
9.75	0.78	0.00	0.00	22.50	4.45	0.62	0.05
10.00	0.82	0.00	0.00	22.75	4.47	0.63	0.05
10.25	0.87	0.00	0.00	23.00	4.48	0.63	0.05
10.50	0.92	0.00	0.00	23.25	4.49	0.64	0.05
10.75	0.99	0.00	0.00	23.50	4.50	0.64	0.05
11.00	1.06	0.00	0.00	23.75	4.52	0.65	0.04
11.25	1.16	0.00	0.00	24.00	**4.53**	**0.65**	0.04
11.50	1.28	0.00	0.00	24.25	4.53	0.65	0.02
11.75	1.75	0.00	0.00	24.50	4.53	0.65	0.00
12.00	3.00	0.15	**0.43**	24.75	4.53	0.65	0.00
12.25	3.20	0.20	**0.87**	25.00	4.53	0.65	0.00
12.50	3.33	0.23	0.42	25.25	4.53	0.65	0.00
12.75	3.42	0.26	0.27	25.50	4.53	0.65	0.00
13.00	3.50	0.28	0.21	25.75	4.53	0.65	0.00
13.25	3.56	0.30	0.18	26.00	4.53	0.65	0.00
13.50	3.62	0.32	0.16	26.25	4.53	0.65	0.00
13.75	3.67	0.33	0.14	26.50	4.53	0.65	0.00
14.00	3.71	0.35	0.13	26.75	4.53	0.65	0.00
14.25	3.76	0.36	0.12	27.00	4.53	0.65	0.00
14.50	3.79	0.38	0.11	27.25	4.53	0.65	0.00
14.75	3.83	0.39	0.11	27.50	4.53	0.65	0.00
15.00	3.87	0.40	0.10	27.75	4.53	0.65	0.00
15.25	3.90	0.41	0.10	28.00	4.53	0.65	0.00
15.50	3.93	0.42	0.10	28.25	4.53	0.65	0.00
15.75	3.96	0.43	0.09	28.50	4.53	0.65	0.00
16.00	3.99	0.44	0.09	28.75	4.53	0.65	0.00
16.25	4.01	0.45	0.08	29.00	4.53	0.65	0.00
16.50	4.04	0.46	0.08	29.25	4.53	0.65	0.00
16.75	4.06	0.47	0.08	29.50	4.53	0.65	0.00
17.00	4.08	0.48	0.07	29.75	4.53	0.65	0.00
17.25	4.11	0.49	0.07	30.00	4.53	0.65	0.00
17.50	4.13	0.49	0.07				

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.467	30	Meadow, non-grazed, HSG A (DA10a + DA6, DA5, DA9)
0.304	98	Paved parking, HSG A (DA10a + DA6, DA5)
0.771	**57**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.771	HSG A	DA10a + DA6, DA5, DA9
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.771		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.467	0.000	0.000	0.000	0.000	0.467	Meadow, non-grazed	DA10a + DA6, DA5, DA9
0.304	0.000	0.000	0.000	0.000	0.304	Paved parking	DA10a + DA6, DA5
0.771	**0.000**	**0.000**	**0.000**	**0.000**	**0.771**	**TOTAL AREA**	

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA10a + DA6: CC6 Runoff Area=21,691 sf 41.00% Impervious Runoff Depth=0.92"
Flow Length=585' Tc=11.7 min CN=58 Runoff=0.57 cfs 0.038 af

Subcatchment DA5: CC5 Runoff Area=7,190 sf 60.75% Impervious Runoff Depth=1.77"
Flow Length=329' Tc=5.9 min CN=71 Runoff=0.51 cfs 0.024 af

Subcatchment DA9: CC7 Runoff Area=4,704 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=177' Tc=10.1 min CN=30 Runoff=0.00 cfs 0.000 af

Total Runoff Area = 0.771 ac Runoff Volume = 0.062 af Average Runoff Depth = 0.97"
60.52% Pervious = 0.467 ac 39.48% Impervious = 0.304 ac

Summary for Subcatchment DA10a + DA6: CC6

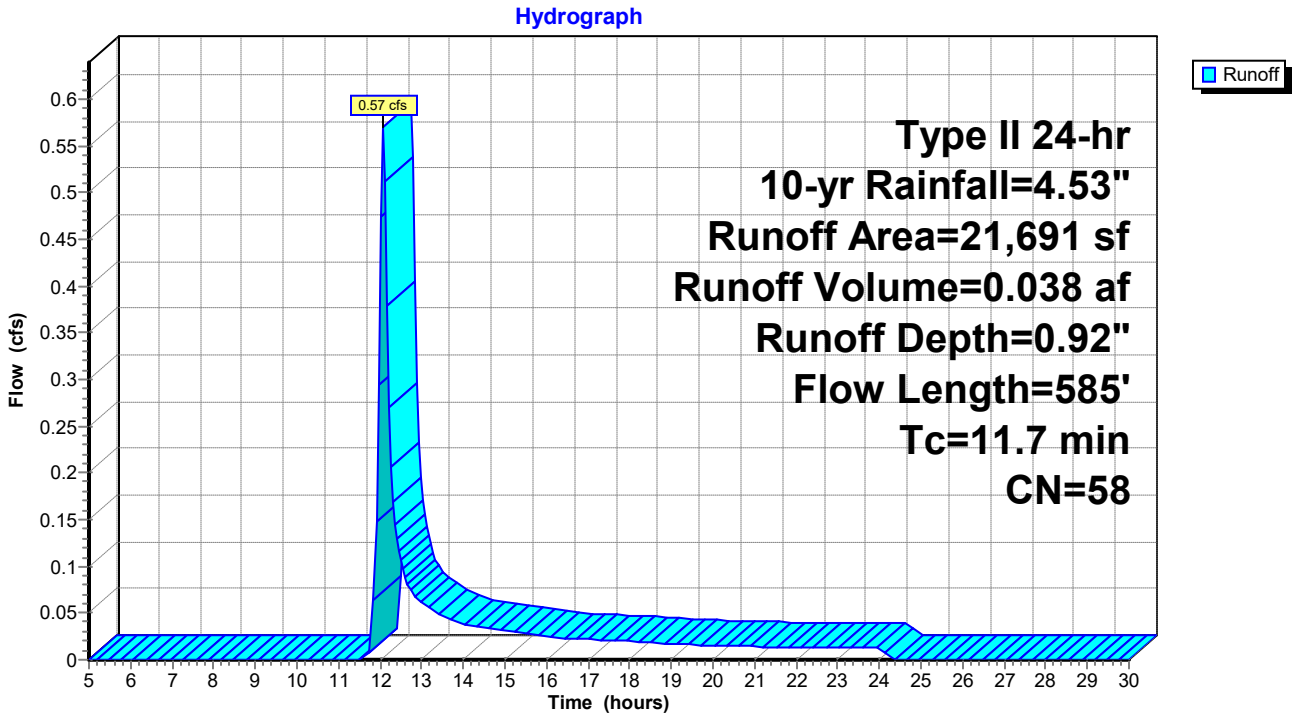
Runoff = 0.57 cfs @ 12.06 hrs, Volume= 0.038 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
8,893	98	Paved parking, HSG A
12,798	30	Meadow, non-grazed, HSG A
21,691	58	Weighted Average
12,798		59.00% Pervious Area
8,893		41.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	47	0.0430	1.59		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.12"
0.4	57	0.0870	2.19		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.12"
10.8	481	0.0220	0.74	1.11	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
11.7	585	Total			

Subcatchment DA10a + DA6: CC6



Hydrograph for Subcatchment DA10a + DA6: CC6

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	0.00	0.00	17.75	4.15	0.73	0.02
5.25	0.30	0.00	0.00	18.00	4.17	0.74	0.02
5.50	0.32	0.00	0.00	18.25	4.19	0.75	0.02
5.75	0.34	0.00	0.00	18.50	4.21	0.76	0.02
6.00	0.36	0.00	0.00	18.75	4.23	0.77	0.02
6.25	0.38	0.00	0.00	19.00	4.25	0.78	0.02
6.50	0.40	0.00	0.00	19.25	4.27	0.79	0.02
6.75	0.43	0.00	0.00	19.50	4.28	0.80	0.02
7.00	0.45	0.00	0.00	19.75	4.30	0.80	0.02
7.25	0.47	0.00	0.00	20.00	4.31	0.81	0.01
7.50	0.49	0.00	0.00	20.25	4.33	0.82	0.01
7.75	0.52	0.00	0.00	20.50	4.34	0.83	0.01
8.00	0.54	0.00	0.00	20.75	4.36	0.83	0.01
8.25	0.57	0.00	0.00	21.00	4.37	0.84	0.01
8.50	0.60	0.00	0.00	21.25	4.38	0.85	0.01
8.75	0.63	0.00	0.00	21.50	4.40	0.85	0.01
9.00	0.67	0.00	0.00	21.75	4.41	0.86	0.01
9.25	0.70	0.00	0.00	22.00	4.43	0.87	0.01
9.50	0.74	0.00	0.00	22.25	4.44	0.87	0.01
9.75	0.78	0.00	0.00	22.50	4.45	0.88	0.01
10.00	0.82	0.00	0.00	22.75	4.47	0.89	0.01
10.25	0.87	0.00	0.00	23.00	4.48	0.89	0.01
10.50	0.92	0.00	0.00	23.25	4.49	0.90	0.01
10.75	0.99	0.00	0.00	23.50	4.50	0.91	0.01
11.00	1.06	0.00	0.00	23.75	4.52	0.91	0.01
11.25	1.16	0.00	0.00	24.00	**4.53**	**0.92**	0.01
11.50	1.28	0.00	0.00	24.25	4.53	0.92	0.00
11.75	1.75	0.01	0.01	24.50	4.53	0.92	0.00
12.00	3.00	0.27	**0.47**	24.75	4.53	0.92	0.00
12.25	3.20	0.34	**0.21**	25.00	4.53	0.92	0.00
12.50	3.33	0.39	0.11	25.25	4.53	0.92	0.00
12.75	3.42	0.42	0.07	25.50	4.53	0.92	0.00
13.00	3.50	0.45	0.06	25.75	4.53	0.92	0.00
13.25	3.56	0.48	0.05	26.00	4.53	0.92	0.00
13.50	3.62	0.50	0.05	26.25	4.53	0.92	0.00
13.75	3.67	0.52	0.04	26.50	4.53	0.92	0.00
14.00	3.71	0.54	0.04	26.75	4.53	0.92	0.00
14.25	3.76	0.56	0.04	27.00	4.53	0.92	0.00
14.50	3.79	0.57	0.03	27.25	4.53	0.92	0.00
14.75	3.83	0.59	0.03	27.50	4.53	0.92	0.00
15.00	3.87	0.61	0.03	27.75	4.53	0.92	0.00
15.25	3.90	0.62	0.03	28.00	4.53	0.92	0.00
15.50	3.93	0.63	0.03	28.25	4.53	0.92	0.00
15.75	3.96	0.65	0.03	28.50	4.53	0.92	0.00
16.00	3.99	0.66	0.02	28.75	4.53	0.92	0.00
16.25	4.01	0.67	0.02	29.00	4.53	0.92	0.00
16.50	4.04	0.68	0.02	29.25	4.53	0.92	0.00
16.75	4.06	0.69	0.02	29.50	4.53	0.92	0.00
17.00	4.08	0.70	0.02	29.75	4.53	0.92	0.00
17.25	4.11	0.71	0.02	30.00	4.53	0.92	0.00
17.50	4.13	0.72	0.02				

Summary for Subcatchment DA5: CC5

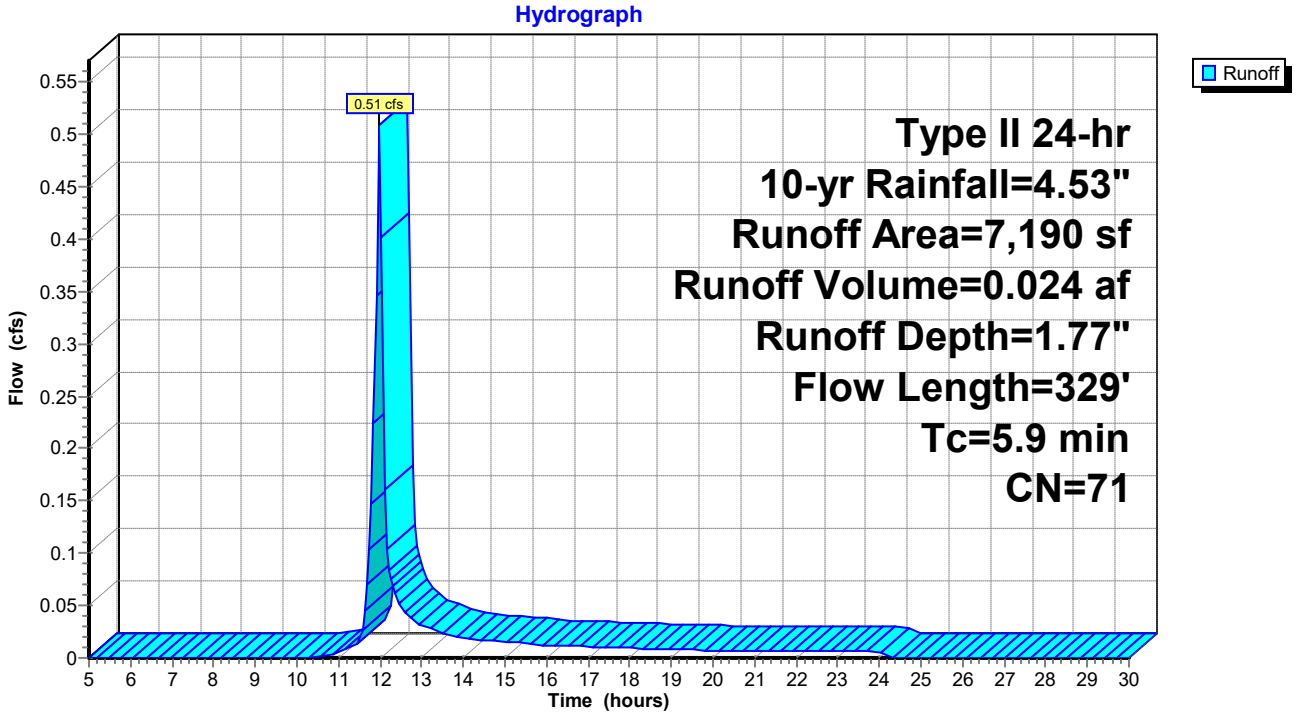
Runoff = 0.51 cfs @ 11.98 hrs, Volume= 0.024 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
4,368	98	Paved parking, HSG A
2,822	30	Meadow, non-grazed, HSG A
7,190	71	Weighted Average
2,822		39.25% Pervious Area
4,368		60.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	90	0.0440	1.82		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.12"
5.1	239	0.0250	0.79	1.18	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
5.9	329	Total			

Subcatchment DA5: CC5



Hydrograph for Subcatchment DA5: CC5

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	0.00	0.00	17.75	4.15	1.50	0.01
5.25	0.30	0.00	0.00	18.00	4.17	1.51	0.01
5.50	0.32	0.00	0.00	18.25	4.19	1.53	0.01
5.75	0.34	0.00	0.00	18.50	4.21	1.54	0.01
6.00	0.36	0.00	0.00	18.75	4.23	1.55	0.01
6.25	0.38	0.00	0.00	19.00	4.25	1.57	0.01
6.50	0.40	0.00	0.00	19.25	4.27	1.58	0.01
6.75	0.43	0.00	0.00	19.50	4.28	1.59	0.01
7.00	0.45	0.00	0.00	19.75	4.30	1.60	0.01
7.25	0.47	0.00	0.00	20.00	4.31	1.61	0.01
7.50	0.49	0.00	0.00	20.25	4.33	1.62	0.01
7.75	0.52	0.00	0.00	20.50	4.34	1.63	0.01
8.00	0.54	0.00	0.00	20.75	4.36	1.64	0.01
8.25	0.57	0.00	0.00	21.00	4.37	1.65	0.01
8.50	0.60	0.00	0.00	21.25	4.38	1.66	0.01
8.75	0.63	0.00	0.00	21.50	4.40	1.67	0.01
9.00	0.67	0.00	0.00	21.75	4.41	1.68	0.01
9.25	0.70	0.00	0.00	22.00	4.43	1.69	0.01
9.50	0.74	0.00	0.00	22.25	4.44	1.70	0.01
9.75	0.78	0.00	0.00	22.50	4.45	1.71	0.01
10.00	0.82	0.00	0.00	22.75	4.47	1.72	0.01
10.25	0.87	0.00	0.00	23.00	4.48	1.73	0.01
10.50	0.92	0.00	0.00	23.25	4.49	1.74	0.01
10.75	0.99	0.01	0.00	23.50	4.50	1.75	0.01
11.00	1.06	0.01	0.01	23.75	4.52	1.76	0.01
11.25	1.16	0.03	0.01	24.00	**4.53**	**1.77**	0.01
11.50	1.28	0.05	0.01	24.25	4.53	1.77	0.00
11.75	1.75	0.17	0.10	24.50	4.53	1.77	0.00
12.00	3.00	0.76	**0.49**	24.75	4.53	1.77	0.00
12.25	3.20	0.88	0.07	25.00	4.53	1.77	0.00
12.50	3.33	0.96	0.05	25.25	4.53	1.77	0.00
12.75	3.42	1.01	0.04	25.50	4.53	1.77	0.00
13.00	3.50	1.06	0.03	25.75	4.53	1.77	0.00
13.25	3.56	1.10	0.03	26.00	4.53	1.77	0.00
13.50	3.62	1.14	0.02	26.25	4.53	1.77	0.00
13.75	3.67	1.17	0.02	26.50	4.53	1.77	0.00
14.00	3.71	1.20	0.02	26.75	4.53	1.77	0.00
14.25	3.76	1.23	0.02	27.00	4.53	1.77	0.00
14.50	3.79	1.26	0.02	27.25	4.53	1.77	0.00
14.75	3.83	1.28	0.02	27.50	4.53	1.77	0.00
15.00	3.87	1.30	0.02	27.75	4.53	1.77	0.00
15.25	3.90	1.33	0.01	28.00	4.53	1.77	0.00
15.50	3.93	1.35	0.01	28.25	4.53	1.77	0.00
15.75	3.96	1.37	0.01	28.50	4.53	1.77	0.00
16.00	3.99	1.38	0.01	28.75	4.53	1.77	0.00
16.25	4.01	1.40	0.01	29.00	4.53	1.77	0.00
16.50	4.04	1.42	0.01	29.25	4.53	1.77	0.00
16.75	4.06	1.44	0.01	29.50	4.53	1.77	0.00
17.00	4.08	1.45	0.01	29.75	4.53	1.77	0.00
17.25	4.11	1.47	0.01	30.00	4.53	1.77	0.00
17.50	4.13	1.48	0.01				

Summary for Subcatchment DA9: CC7

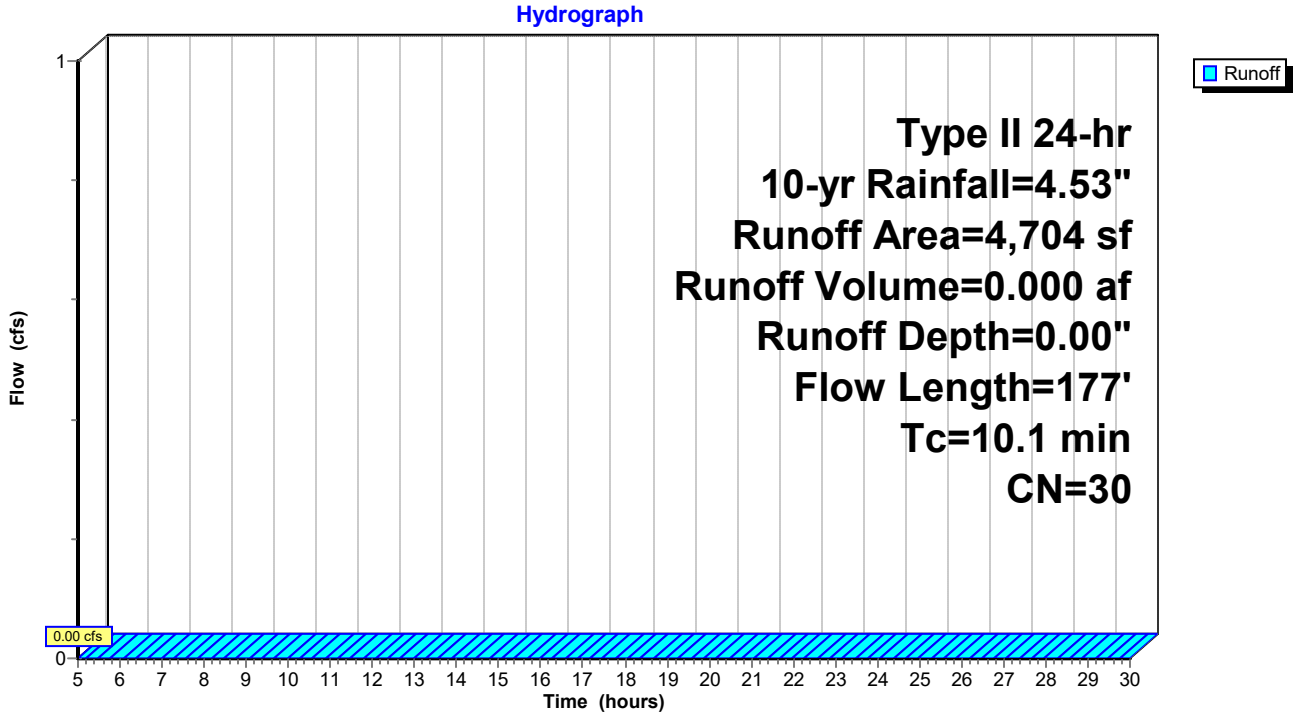
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
4,704	30	Meadow, non-grazed, HSG A
4,704		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	84	0.0240	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
2.1	93	0.0220	0.74	1.11	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
10.1	177	Total			

Subcatchment DA9: CC7



Hydrograph for Subcatchment DA9: CC7

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	**0.00**	**0.00**	17.75	4.15	0.00	0.00
5.25	0.30	0.00	0.00	18.00	4.17	0.00	0.00
5.50	0.32	0.00	0.00	18.25	4.19	0.00	0.00
5.75	0.34	0.00	0.00	18.50	4.21	0.00	0.00
6.00	0.36	0.00	0.00	18.75	4.23	0.00	0.00
6.25	0.38	0.00	0.00	19.00	4.25	0.00	0.00
6.50	0.40	0.00	0.00	19.25	4.27	0.00	0.00
6.75	0.43	0.00	0.00	19.50	4.28	0.00	0.00
7.00	0.45	0.00	0.00	19.75	4.30	0.00	0.00
7.25	0.47	0.00	0.00	20.00	4.31	0.00	0.00
7.50	0.49	0.00	0.00	20.25	4.33	0.00	0.00
7.75	0.52	0.00	0.00	20.50	4.34	0.00	0.00
8.00	0.54	0.00	0.00	20.75	4.36	0.00	0.00
8.25	0.57	0.00	0.00	21.00	4.37	0.00	0.00
8.50	0.60	0.00	0.00	21.25	4.38	0.00	0.00
8.75	0.63	0.00	0.00	21.50	4.40	0.00	0.00
9.00	0.67	0.00	0.00	21.75	4.41	0.00	0.00
9.25	0.70	0.00	0.00	22.00	4.43	0.00	0.00
9.50	0.74	0.00	0.00	22.25	4.44	0.00	0.00
9.75	0.78	0.00	0.00	22.50	4.45	0.00	0.00
10.00	0.82	0.00	0.00	22.75	4.47	0.00	0.00
10.25	0.87	0.00	0.00	23.00	4.48	0.00	0.00
10.50	0.92	0.00	0.00	23.25	4.49	0.00	0.00
10.75	0.99	0.00	0.00	23.50	4.50	0.00	0.00
11.00	1.06	0.00	0.00	23.75	4.52	0.00	0.00
11.25	1.16	0.00	0.00	24.00	**4.53**	0.00	0.00
11.50	1.28	0.00	0.00	24.25	4.53	0.00	0.00
11.75	1.75	0.00	0.00	24.50	4.53	0.00	0.00
12.00	3.00	0.00	0.00	24.75	4.53	0.00	0.00
12.25	3.20	0.00	0.00	25.00	4.53	0.00	0.00
12.50	3.33	0.00	0.00	25.25	4.53	0.00	0.00
12.75	3.42	0.00	0.00	25.50	4.53	0.00	0.00
13.00	3.50	0.00	0.00	25.75	4.53	0.00	0.00
13.25	3.56	0.00	0.00	26.00	4.53	0.00	0.00
13.50	3.62	0.00	0.00	26.25	4.53	0.00	0.00
13.75	3.67	0.00	0.00	26.50	4.53	0.00	0.00
14.00	3.71	0.00	0.00	26.75	4.53	0.00	0.00
14.25	3.76	0.00	0.00	27.00	4.53	0.00	0.00
14.50	3.79	0.00	0.00	27.25	4.53	0.00	0.00
14.75	3.83	0.00	0.00	27.50	4.53	0.00	0.00
15.00	3.87	0.00	0.00	27.75	4.53	0.00	0.00
15.25	3.90	0.00	0.00	28.00	4.53	0.00	0.00
15.50	3.93	0.00	0.00	28.25	4.53	0.00	0.00
15.75	3.96	0.00	0.00	28.50	4.53	0.00	0.00
16.00	3.99	0.00	0.00	28.75	4.53	0.00	0.00
16.25	4.01	0.00	0.00	29.00	4.53	0.00	0.00
16.50	4.04	0.00	0.00	29.25	4.53	0.00	0.00
16.75	4.06	0.00	0.00	29.50	4.53	0.00	0.00
17.00	4.08	0.00	0.00	29.75	4.53	0.00	0.00
17.25	4.11	0.00	0.00	30.00	4.53	0.00	0.00
17.50	4.13	0.00	0.00				

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
7.901	30	Meadow, non-grazed, HSG A (DA10b, DA11, DA12, DA14, DA4a)
0.375	58	Meadow, non-grazed, HSG B (DA4a)
1.093	98	Paved parking, HSG A (DA10b, DA11)
0.431	98	Paved parking, HSG B (DA4a)
9.800	**42**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
8.994	HSG A	DA10b, DA11, DA12, DA14, DA4a
0.806	HSG B	DA4a
0.000	HSG C	
0.000	HSG D	
0.000	Other	
9.800		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
7.901	0.375	0.000	0.000	0.000	8.276	Meadow, non-grazed	DA10b, DA11, DA12, DA14, DA4a
1.093	0.431	0.000	0.000	0.000	1.524	Paved parking	DA10b, DA11, DA4a
8.994	**0.806**	**0.000**	**0.000**	**0.000**	**9.800**	**TOTAL AREA**	

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA10b: CC8 Runoff Area=53,564 sf 57.09% Impervious Runoff Depth=1.62"
Flow Length=343' Tc=4.9 min CN=69 Runoff=3.59 cfs 0.166 af

Subcatchment DA11: CC11 Runoff Area=95,832 sf 17.78% Impervious Runoff Depth=0.20"
Flow Length=673' Tc=15.0 min CN=42 Runoff=0.08 cfs 0.037 af

Subcatchment DA12: CC12 Runoff Area=0.710 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=418' Tc=15.3 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment DA14: CC9 Runoff Area=2.790 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=268' Slope=0.0150 '/' Tc=15.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment DA4a: CC10 Runoff Area=125,017 sf 15.00% Impervious Runoff Depth=0.27"
Flow Length=800' Tc=18.1 min CN=44 Runoff=0.22 cfs 0.064 af

Total Runoff Area = 9.800 ac Runoff Volume = 0.267 af Average Runoff Depth = 0.33"
84.45% Pervious = 8.276 ac 15.55% Impervious = 1.524 ac

Summary for Subcatchment DA10b: CC8

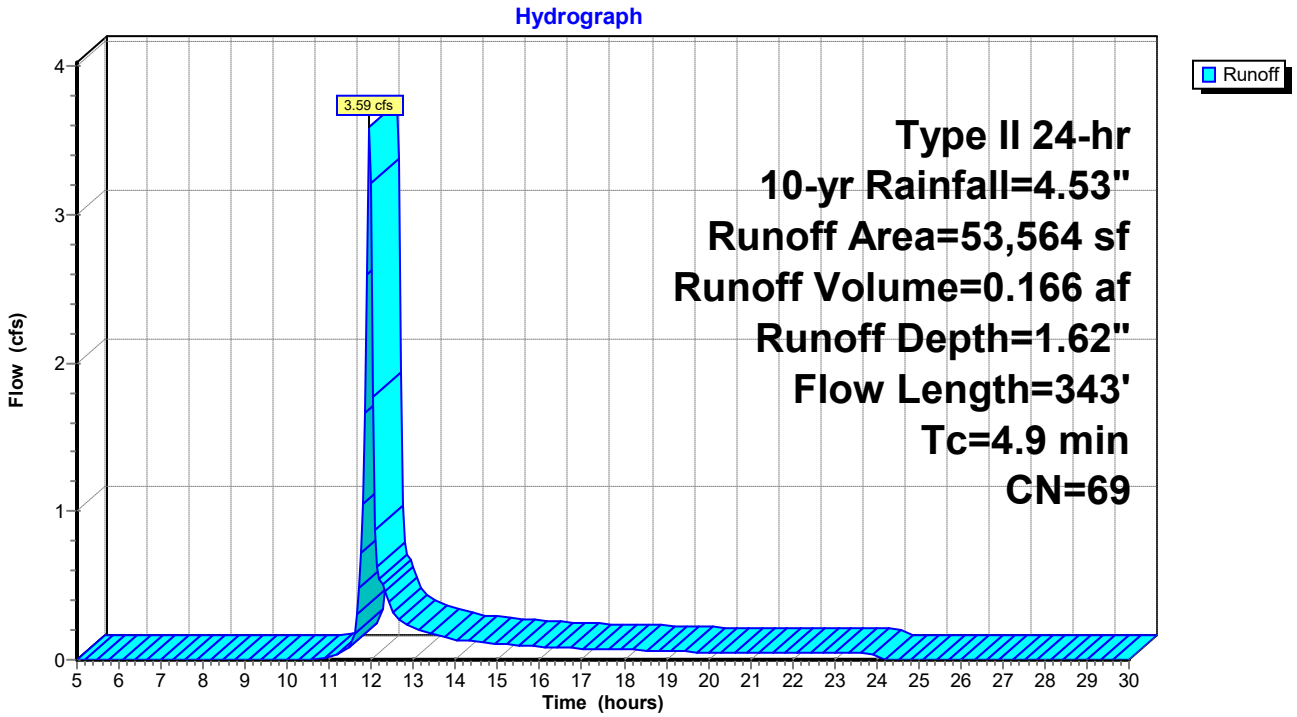
Runoff = 3.59 cfs @ 11.96 hrs, Volume= 0.166 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
30,582	98	Paved parking, HSG A
22,982	30	Meadow, non-grazed, HSG A
53,564	69	Weighted Average
22,982		42.91% Pervious Area
30,582		57.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0500	1.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.12"
0.1	20	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	223	0.0360	0.95	1.42	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
4.9	343	Total			

Subcatchment DA10b: CC8



Hydrograph for Subcatchment DA10b: CC8

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	0.00	0.00	17.75	4.15	1.37	0.07
5.25	0.30	0.00	0.00	18.00	4.17	1.38	0.07
5.50	0.32	0.00	0.00	18.25	4.19	1.39	0.07
5.75	0.34	0.00	0.00	18.50	4.21	1.41	0.06
6.00	0.36	0.00	0.00	18.75	4.23	1.42	0.06
6.25	0.38	0.00	0.00	19.00	4.25	1.43	0.06
6.50	0.40	0.00	0.00	19.25	4.27	1.44	0.06
6.75	0.43	0.00	0.00	19.50	4.28	1.45	0.05
7.00	0.45	0.00	0.00	19.75	4.30	1.46	0.05
7.25	0.47	0.00	0.00	20.00	4.31	1.47	0.05
7.50	0.49	0.00	0.00	20.25	4.33	1.48	0.05
7.75	0.52	0.00	0.00	20.50	4.34	1.49	0.05
8.00	0.54	0.00	0.00	20.75	4.36	1.50	0.05
8.25	0.57	0.00	0.00	21.00	4.37	1.51	0.05
8.50	0.60	0.00	0.00	21.25	4.38	1.52	0.05
8.75	0.63	0.00	0.00	21.50	4.40	1.53	0.05
9.00	0.67	0.00	0.00	21.75	4.41	1.54	0.05
9.25	0.70	0.00	0.00	22.00	4.43	1.55	0.05
9.50	0.74	0.00	0.00	22.25	4.44	1.56	0.05
9.75	0.78	0.00	0.00	22.50	4.45	1.57	0.05
10.00	0.82	0.00	0.00	22.75	4.47	1.58	0.05
10.25	0.87	0.00	0.00	23.00	4.48	1.59	0.04
10.50	0.92	0.00	0.00	23.25	4.49	1.60	0.04
10.75	0.99	0.00	0.01	23.50	4.50	1.61	0.04
11.00	1.06	0.01	0.02	23.75	4.52	1.61	0.04
11.25	1.16	0.01	0.05	24.00	**4.53**	**1.62**	0.04
11.50	1.28	0.03	0.09	24.25	4.53	1.62	0.00
11.75	1.75	0.14	**0.72**	24.50	4.53	1.62	0.00
12.00	3.00	0.67	**3.21**	24.75	4.53	1.62	0.00
12.25	3.20	0.78	0.50	25.00	4.53	1.62	0.00
12.50	3.33	0.85	0.34	25.25	4.53	1.62	0.00
12.75	3.42	0.91	0.26	25.50	4.53	1.62	0.00
13.00	3.50	0.95	0.22	25.75	4.53	1.62	0.00
13.25	3.56	0.99	0.19	26.00	4.53	1.62	0.00
13.50	3.62	1.03	0.17	26.25	4.53	1.62	0.00
13.75	3.67	1.06	0.15	26.50	4.53	1.62	0.00
14.00	3.71	1.09	0.13	26.75	4.53	1.62	0.00
14.25	3.76	1.11	0.13	27.00	4.53	1.62	0.00
14.50	3.79	1.14	0.12	27.25	4.53	1.62	0.00
14.75	3.83	1.16	0.11	27.50	4.53	1.62	0.00
15.00	3.87	1.18	0.11	27.75	4.53	1.62	0.00
15.25	3.90	1.20	0.10	28.00	4.53	1.62	0.00
15.50	3.93	1.22	0.10	28.25	4.53	1.62	0.00
15.75	3.96	1.24	0.09	28.50	4.53	1.62	0.00
16.00	3.99	1.26	0.09	28.75	4.53	1.62	0.00
16.25	4.01	1.27	0.08	29.00	4.53	1.62	0.00
16.50	4.04	1.29	0.08	29.25	4.53	1.62	0.00
16.75	4.06	1.31	0.08	29.50	4.53	1.62	0.00
17.00	4.08	1.32	0.08	29.75	4.53	1.62	0.00
17.25	4.11	1.34	0.07	30.00	4.53	1.62	0.00
17.50	4.13	1.35	0.07				

Summary for Subcatchment DA11: CC11

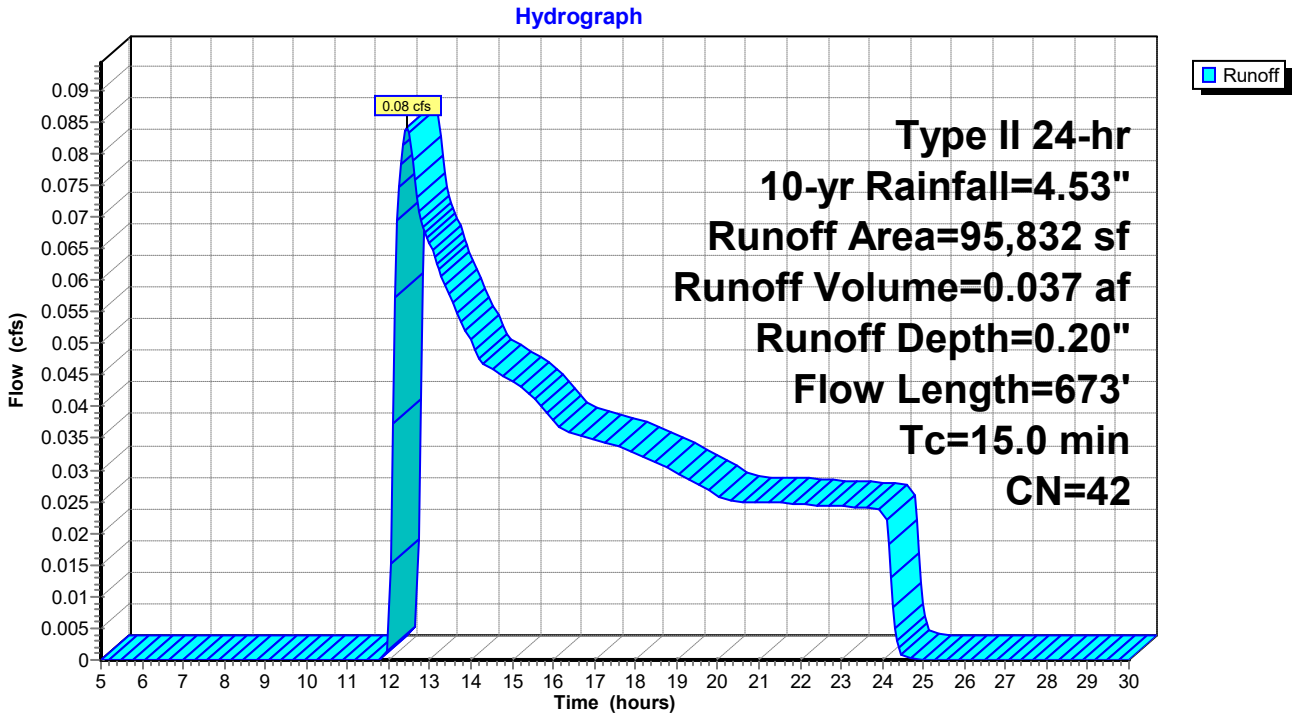
Runoff = 0.08 cfs @ 12.45 hrs, Volume= 0.037 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
17,041	98	Paved parking, HSG A
78,791	30	Meadow, non-grazed, HSG A
95,832	42	Weighted Average
78,791		82.22% Pervious Area
17,041		17.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0240	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
0.4	75	0.0340	2.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	16	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	307	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.6	175	0.0260	0.80	1.21	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
15.0	673	Total			

Subcatchment DA11: CC11



Hydrograph for Subcatchment DA11: CC11

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	0.00	0.00	17.75	4.15	0.13	0.03
5.25	0.30	0.00	0.00	18.00	4.17	0.13	0.03
5.50	0.32	0.00	0.00	18.25	4.19	0.13	0.03
5.75	0.34	0.00	0.00	18.50	4.21	0.14	0.03
6.00	0.36	0.00	0.00	18.75	4.23	0.14	0.03
6.25	0.38	0.00	0.00	19.00	4.25	0.14	0.03
6.50	0.40	0.00	0.00	19.25	4.27	0.15	0.03
6.75	0.43	0.00	0.00	19.50	4.28	0.15	0.03
7.00	0.45	0.00	0.00	19.75	4.30	0.15	0.03
7.25	0.47	0.00	0.00	20.00	4.31	0.16	0.03
7.50	0.49	0.00	0.00	20.25	4.33	0.16	0.03
7.75	0.52	0.00	0.00	20.50	4.34	0.16	0.03
8.00	0.54	0.00	0.00	20.75	4.36	0.16	0.02
8.25	0.57	0.00	0.00	21.00	4.37	0.17	0.02
8.50	0.60	0.00	0.00	21.25	4.38	0.17	0.02
8.75	0.63	0.00	0.00	21.50	4.40	0.17	0.02
9.00	0.67	0.00	0.00	21.75	4.41	0.18	0.02
9.25	0.70	0.00	0.00	22.00	4.43	0.18	0.02
9.50	0.74	0.00	0.00	22.25	4.44	0.18	0.02
9.75	0.78	0.00	0.00	22.50	4.45	0.18	0.02
10.00	0.82	0.00	0.00	22.75	4.47	0.19	0.02
10.25	0.87	0.00	0.00	23.00	4.48	0.19	0.02
10.50	0.92	0.00	0.00	23.25	4.49	0.19	0.02
10.75	0.99	0.00	0.00	23.50	4.50	0.20	0.02
11.00	1.06	0.00	0.00	23.75	4.52	0.20	0.02
11.25	1.16	0.00	0.00	24.00	**4.53**	**0.20**	0.02
11.50	1.28	0.00	0.00	24.25	4.53	0.20	0.01
11.75	1.75	0.00	0.00	24.50	4.53	0.20	0.00
12.00	3.00	0.00	0.00	24.75	4.53	0.20	0.00
12.25	3.20	0.01	**0.07**	25.00	4.53	0.20	0.00
12.50	3.33	0.02	**0.08**	25.25	4.53	0.20	0.00
12.75	3.42	0.03	0.07	25.50	4.53	0.20	0.00
13.00	3.50	0.04	0.07	25.75	4.53	0.20	0.00
13.25	3.56	0.04	0.06	26.00	4.53	0.20	0.00
13.50	3.62	0.05	0.06	26.25	4.53	0.20	0.00
13.75	3.67	0.06	0.05	26.50	4.53	0.20	0.00
14.00	3.71	0.06	0.05	26.75	4.53	0.20	0.00
14.25	3.76	0.07	0.05	27.00	4.53	0.20	0.00
14.50	3.79	0.07	0.05	27.25	4.53	0.20	0.00
14.75	3.83	0.08	0.05	27.50	4.53	0.20	0.00
15.00	3.87	0.08	0.04	27.75	4.53	0.20	0.00
15.25	3.90	0.09	0.04	28.00	4.53	0.20	0.00
15.50	3.93	0.09	0.04	28.25	4.53	0.20	0.00
15.75	3.96	0.10	0.04	28.50	4.53	0.20	0.00
16.00	3.99	0.10	0.04	28.75	4.53	0.20	0.00
16.25	4.01	0.10	0.04	29.00	4.53	0.20	0.00
16.50	4.04	0.11	0.04	29.25	4.53	0.20	0.00
16.75	4.06	0.11	0.04	29.50	4.53	0.20	0.00
17.00	4.08	0.12	0.03	29.75	4.53	0.20	0.00
17.25	4.11	0.12	0.03	30.00	4.53	0.20	0.00
17.50	4.13	0.12	0.03				

Summary for Subcatchment DA12: CC12

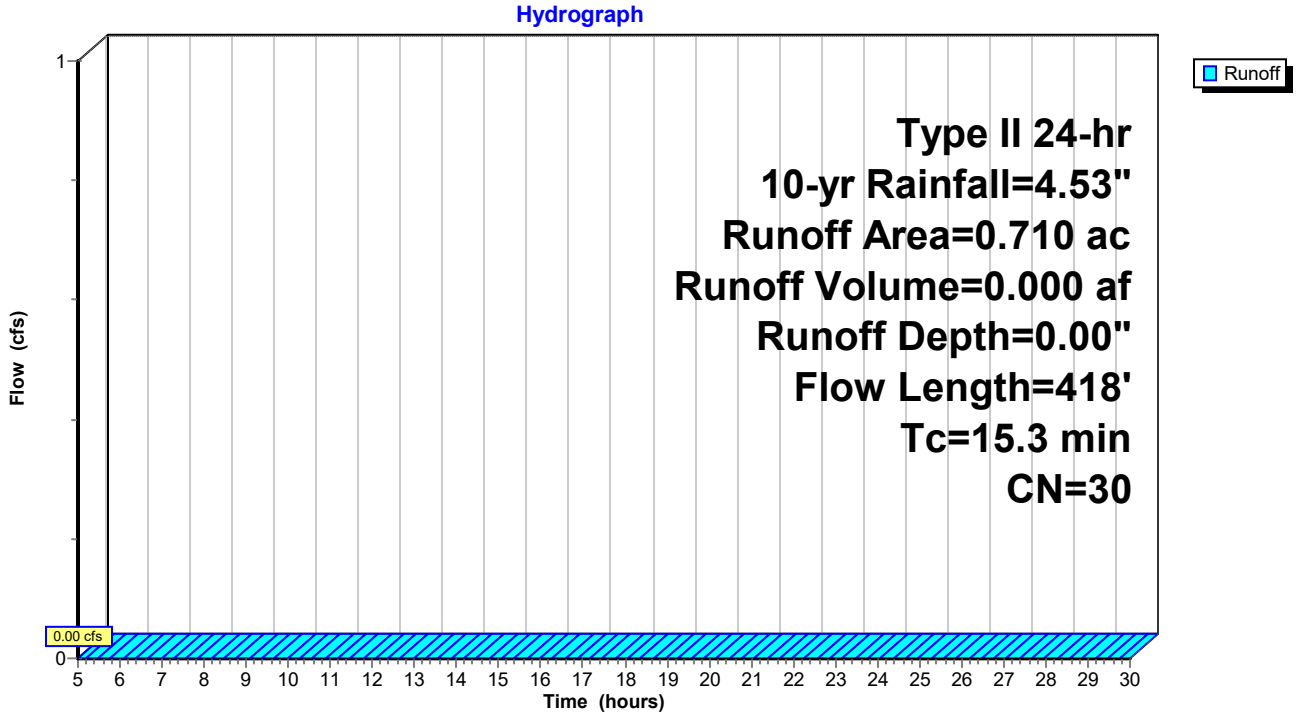
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (ac)	CN	Description
0.710	30	Meadow, non-grazed, HSG A
0.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0280	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
6.6	318	0.0260	0.80	1.21	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
15.3	418	Total			

Subcatchment DA12: CC12



Hydrograph for Subcatchment DA12: CC12

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	**0.00**	**0.00**	17.75	4.15	0.00	0.00
5.25	0.30	0.00	0.00	18.00	4.17	0.00	0.00
5.50	0.32	0.00	0.00	18.25	4.19	0.00	0.00
5.75	0.34	0.00	0.00	18.50	4.21	0.00	0.00
6.00	0.36	0.00	0.00	18.75	4.23	0.00	0.00
6.25	0.38	0.00	0.00	19.00	4.25	0.00	0.00
6.50	0.40	0.00	0.00	19.25	4.27	0.00	0.00
6.75	0.43	0.00	0.00	19.50	4.28	0.00	0.00
7.00	0.45	0.00	0.00	19.75	4.30	0.00	0.00
7.25	0.47	0.00	0.00	20.00	4.31	0.00	0.00
7.50	0.49	0.00	0.00	20.25	4.33	0.00	0.00
7.75	0.52	0.00	0.00	20.50	4.34	0.00	0.00
8.00	0.54	0.00	0.00	20.75	4.36	0.00	0.00
8.25	0.57	0.00	0.00	21.00	4.37	0.00	0.00
8.50	0.60	0.00	0.00	21.25	4.38	0.00	0.00
8.75	0.63	0.00	0.00	21.50	4.40	0.00	0.00
9.00	0.67	0.00	0.00	21.75	4.41	0.00	0.00
9.25	0.70	0.00	0.00	22.00	4.43	0.00	0.00
9.50	0.74	0.00	0.00	22.25	4.44	0.00	0.00
9.75	0.78	0.00	0.00	22.50	4.45	0.00	0.00
10.00	0.82	0.00	0.00	22.75	4.47	0.00	0.00
10.25	0.87	0.00	0.00	23.00	4.48	0.00	0.00
10.50	0.92	0.00	0.00	23.25	4.49	0.00	0.00
10.75	0.99	0.00	0.00	23.50	4.50	0.00	0.00
11.00	1.06	0.00	0.00	23.75	4.52	0.00	0.00
11.25	1.16	0.00	0.00	24.00	**4.53**	0.00	0.00
11.50	1.28	0.00	0.00	24.25	4.53	0.00	0.00
11.75	1.75	0.00	0.00	24.50	4.53	0.00	0.00
12.00	3.00	0.00	0.00	24.75	4.53	0.00	0.00
12.25	3.20	0.00	0.00	25.00	4.53	0.00	0.00
12.50	3.33	0.00	0.00	25.25	4.53	0.00	0.00
12.75	3.42	0.00	0.00	25.50	4.53	0.00	0.00
13.00	3.50	0.00	0.00	25.75	4.53	0.00	0.00
13.25	3.56	0.00	0.00	26.00	4.53	0.00	0.00
13.50	3.62	0.00	0.00	26.25	4.53	0.00	0.00
13.75	3.67	0.00	0.00	26.50	4.53	0.00	0.00
14.00	3.71	0.00	0.00	26.75	4.53	0.00	0.00
14.25	3.76	0.00	0.00	27.00	4.53	0.00	0.00
14.50	3.79	0.00	0.00	27.25	4.53	0.00	0.00
14.75	3.83	0.00	0.00	27.50	4.53	0.00	0.00
15.00	3.87	0.00	0.00	27.75	4.53	0.00	0.00
15.25	3.90	0.00	0.00	28.00	4.53	0.00	0.00
15.50	3.93	0.00	0.00	28.25	4.53	0.00	0.00
15.75	3.96	0.00	0.00	28.50	4.53	0.00	0.00
16.00	3.99	0.00	0.00	28.75	4.53	0.00	0.00
16.25	4.01	0.00	0.00	29.00	4.53	0.00	0.00
16.50	4.04	0.00	0.00	29.25	4.53	0.00	0.00
16.75	4.06	0.00	0.00	29.50	4.53	0.00	0.00
17.00	4.08	0.00	0.00	29.75	4.53	0.00	0.00
17.25	4.11	0.00	0.00	30.00	4.53	0.00	0.00
17.50	4.13	0.00	0.00				

Summary for Subcatchment DA14: CC9

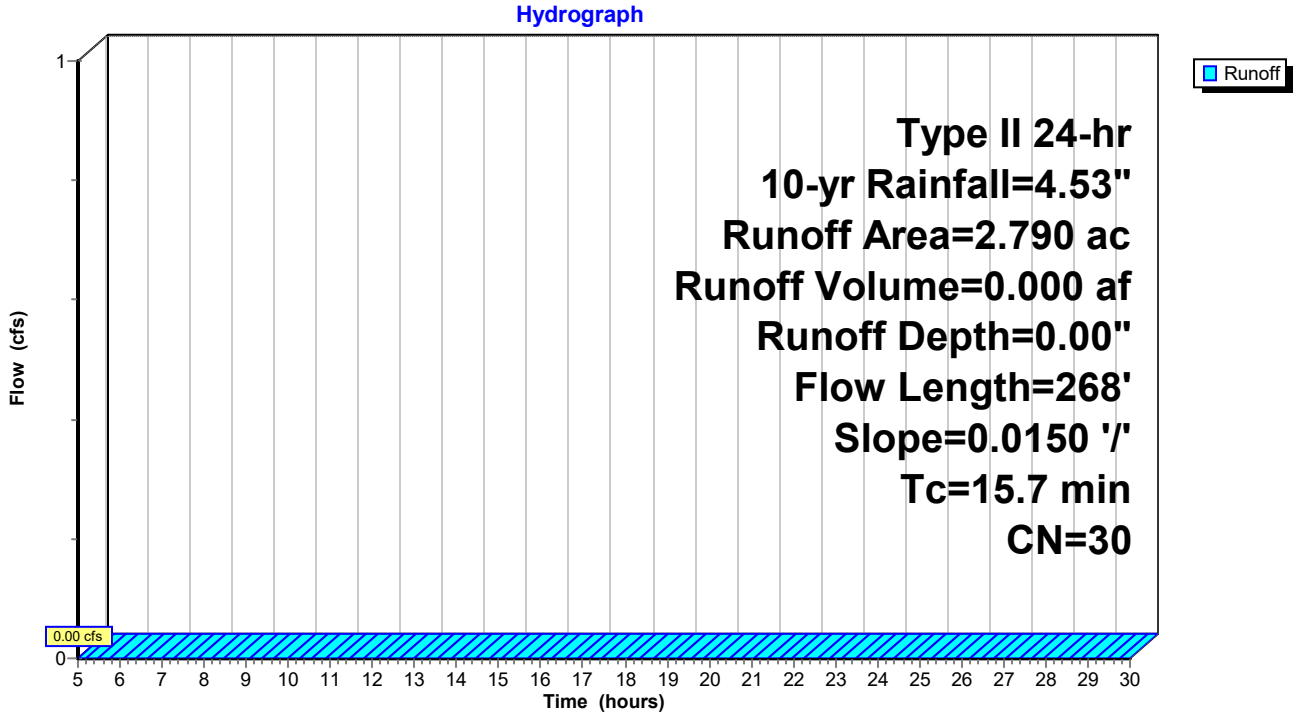
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (ac)	CN	Description
2.790	30	Meadow, non-grazed, HSG A
2.790		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0150	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
4.6	168	0.0150	0.61	0.92	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
15.7	268	Total			

Subcatchment DA14: CC9



Hydrograph for Subcatchment DA14: CC9

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	**0.00**	**0.00**	17.75	4.15	0.00	0.00
5.25	0.30	0.00	0.00	18.00	4.17	0.00	0.00
5.50	0.32	0.00	0.00	18.25	4.19	0.00	0.00
5.75	0.34	0.00	0.00	18.50	4.21	0.00	0.00
6.00	0.36	0.00	0.00	18.75	4.23	0.00	0.00
6.25	0.38	0.00	0.00	19.00	4.25	0.00	0.00
6.50	0.40	0.00	0.00	19.25	4.27	0.00	0.00
6.75	0.43	0.00	0.00	19.50	4.28	0.00	0.00
7.00	0.45	0.00	0.00	19.75	4.30	0.00	0.00
7.25	0.47	0.00	0.00	20.00	4.31	0.00	0.00
7.50	0.49	0.00	0.00	20.25	4.33	0.00	0.00
7.75	0.52	0.00	0.00	20.50	4.34	0.00	0.00
8.00	0.54	0.00	0.00	20.75	4.36	0.00	0.00
8.25	0.57	0.00	0.00	21.00	4.37	0.00	0.00
8.50	0.60	0.00	0.00	21.25	4.38	0.00	0.00
8.75	0.63	0.00	0.00	21.50	4.40	0.00	0.00
9.00	0.67	0.00	0.00	21.75	4.41	0.00	0.00
9.25	0.70	0.00	0.00	22.00	4.43	0.00	0.00
9.50	0.74	0.00	0.00	22.25	4.44	0.00	0.00
9.75	0.78	0.00	0.00	22.50	4.45	0.00	0.00
10.00	0.82	0.00	0.00	22.75	4.47	0.00	0.00
10.25	0.87	0.00	0.00	23.00	4.48	0.00	0.00
10.50	0.92	0.00	0.00	23.25	4.49	0.00	0.00
10.75	0.99	0.00	0.00	23.50	4.50	0.00	0.00
11.00	1.06	0.00	0.00	23.75	4.52	0.00	0.00
11.25	1.16	0.00	0.00	24.00	**4.53**	0.00	0.00
11.50	1.28	0.00	0.00	24.25	4.53	0.00	0.00
11.75	1.75	0.00	0.00	24.50	4.53	0.00	0.00
12.00	3.00	0.00	0.00	24.75	4.53	0.00	0.00
12.25	3.20	0.00	0.00	25.00	4.53	0.00	0.00
12.50	3.33	0.00	0.00	25.25	4.53	0.00	0.00
12.75	3.42	0.00	0.00	25.50	4.53	0.00	0.00
13.00	3.50	0.00	0.00	25.75	4.53	0.00	0.00
13.25	3.56	0.00	0.00	26.00	4.53	0.00	0.00
13.50	3.62	0.00	0.00	26.25	4.53	0.00	0.00
13.75	3.67	0.00	0.00	26.50	4.53	0.00	0.00
14.00	3.71	0.00	0.00	26.75	4.53	0.00	0.00
14.25	3.76	0.00	0.00	27.00	4.53	0.00	0.00
14.50	3.79	0.00	0.00	27.25	4.53	0.00	0.00
14.75	3.83	0.00	0.00	27.50	4.53	0.00	0.00
15.00	3.87	0.00	0.00	27.75	4.53	0.00	0.00
15.25	3.90	0.00	0.00	28.00	4.53	0.00	0.00
15.50	3.93	0.00	0.00	28.25	4.53	0.00	0.00
15.75	3.96	0.00	0.00	28.50	4.53	0.00	0.00
16.00	3.99	0.00	0.00	28.75	4.53	0.00	0.00
16.25	4.01	0.00	0.00	29.00	4.53	0.00	0.00
16.50	4.04	0.00	0.00	29.25	4.53	0.00	0.00
16.75	4.06	0.00	0.00	29.50	4.53	0.00	0.00
17.00	4.08	0.00	0.00	29.75	4.53	0.00	0.00
17.25	4.11	0.00	0.00	30.00	4.53	0.00	0.00
17.50	4.13	0.00	0.00				

Summary for Subcatchment DA4a: CC10

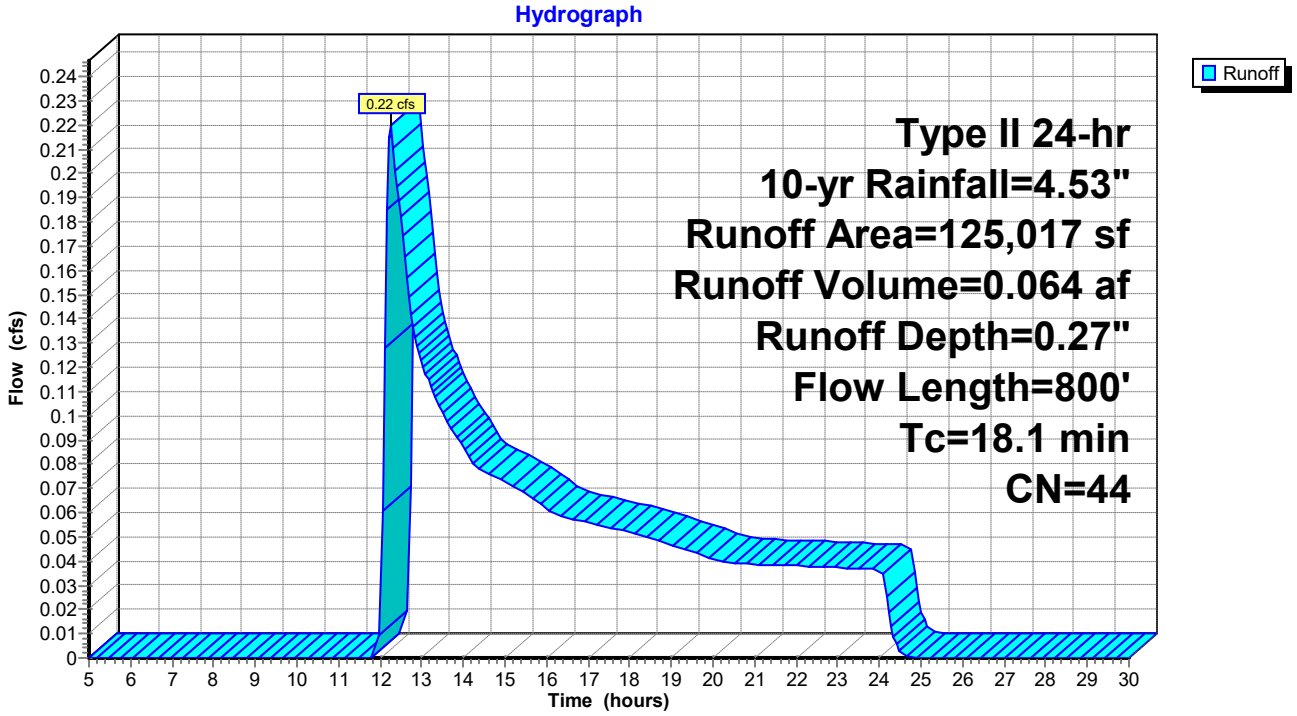
Runoff = 0.22 cfs @ 12.24 hrs, Volume= 0.064 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
18,754	98	Paved parking, HSG B
89,922	30	Meadow, non-grazed, HSG A
16,341	58	Meadow, non-grazed, HSG B
125,017	44	Weighted Average
106,263		85.00% Pervious Area
18,754		15.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0350	1.70		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.12"
7.0	231	0.0120	0.55	0.82	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
10.1	469	0.0240	0.77	1.16	**Channel Flow,** Area= 1.5 sf Perim= 4.2' r= 0.36' n= 0.150 Sheet flow over Short Grass
18.1	800	Total			

Subcatchment DA4a: CC10



Hydrograph for Subcatchment DA4a: CC10

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.29	0.00	0.00	17.75	4.15	0.18	0.05
5.25	0.30	0.00	0.00	18.00	4.17	0.18	0.05
5.50	0.32	0.00	0.00	18.25	4.19	0.19	0.05
5.75	0.34	0.00	0.00	18.50	4.21	0.19	0.05
6.00	0.36	0.00	0.00	18.75	4.23	0.20	0.05
6.25	0.38	0.00	0.00	19.00	4.25	0.20	0.05
6.50	0.40	0.00	0.00	19.25	4.27	0.20	0.05
6.75	0.43	0.00	0.00	19.50	4.28	0.21	0.04
7.00	0.45	0.00	0.00	19.75	4.30	0.21	0.04
7.25	0.47	0.00	0.00	20.00	4.31	0.22	0.04
7.50	0.49	0.00	0.00	20.25	4.33	0.22	0.04
7.75	0.52	0.00	0.00	20.50	4.34	0.22	0.04
8.00	0.54	0.00	0.00	20.75	4.36	0.23	0.04
8.25	0.57	0.00	0.00	21.00	4.37	0.23	0.04
8.50	0.60	0.00	0.00	21.25	4.38	0.23	0.04
8.75	0.63	0.00	0.00	21.50	4.40	0.24	0.04
9.00	0.67	0.00	0.00	21.75	4.41	0.24	0.04
9.25	0.70	0.00	0.00	22.00	4.43	0.24	0.04
9.50	0.74	0.00	0.00	22.25	4.44	0.25	0.04
9.75	0.78	0.00	0.00	22.50	4.45	0.25	0.04
10.00	0.82	0.00	0.00	22.75	4.47	0.25	0.04
10.25	0.87	0.00	0.00	23.00	4.48	0.26	0.04
10.50	0.92	0.00	0.00	23.25	4.49	0.26	0.04
10.75	0.99	0.00	0.00	23.50	4.50	0.26	0.04
11.00	1.06	0.00	0.00	23.75	4.52	0.26	0.04
11.25	1.16	0.00	0.00	24.00	**4.53**	**0.27**	0.04
11.50	1.28	0.00	0.00	24.25	4.53	0.27	0.02
11.75	1.75	0.00	0.00	24.50	4.53	0.27	0.00
12.00	3.00	0.02	0.02	24.75	4.53	0.27	0.00
12.25	3.20	0.03	**0.22**	25.00	4.53	0.27	0.00
12.50	3.33	0.05	0.18	25.25	4.53	0.27	0.00
12.75	3.42	0.06	0.14	25.50	4.53	0.27	0.00
13.00	3.50	0.07	0.12	25.75	4.53	0.27	0.00
13.25	3.56	0.08	0.11	26.00	4.53	0.27	0.00
13.50	3.62	0.08	0.10	26.25	4.53	0.27	0.00
13.75	3.67	0.09	0.09	26.50	4.53	0.27	0.00
14.00	3.71	0.10	0.09	26.75	4.53	0.27	0.00
14.25	3.76	0.11	0.08	27.00	4.53	0.27	0.00
14.50	3.79	0.11	0.08	27.25	4.53	0.27	0.00
14.75	3.83	0.12	0.08	27.50	4.53	0.27	0.00
15.00	3.87	0.12	0.07	27.75	4.53	0.27	0.00
15.25	3.90	0.13	0.07	28.00	4.53	0.27	0.00
15.50	3.93	0.14	0.07	28.25	4.53	0.27	0.00
15.75	3.96	0.14	0.07	28.50	4.53	0.27	0.00
16.00	3.99	0.15	0.06	28.75	4.53	0.27	0.00
16.25	4.01	0.15	0.06	29.00	4.53	0.27	0.00
16.50	4.04	0.16	0.06	29.25	4.53	0.27	0.00
16.75	4.06	0.16	0.06	29.50	4.53	0.27	0.00
17.00	4.08	0.17	0.06	29.75	4.53	0.27	0.00
17.25	4.11	0.17	0.05	30.00	4.53	0.27	0.00
17.50	4.13	0.18	0.05				

CHANNEL LINING-
MANUFACTURER'S SPECIFICATIONS

ROLLMAX™
ROLLED EROSION CONTROL

ROLLED
EROSION CONTROL

SYSTEMS BROCHURE

Tensar®

When It Rains (or Blows, Flows or Washes), It Pours

Erosion not only wears away slopes, degrades shorelines and steals precious topsoil, it can also threaten water sources, damage man-made structures, reconfigure landscapes and disrupt wildlife habitats. Add the stiff penalties at stake for violating Environmental Protection Agency (EPA) or local enforcement agency regulations, and the costs of erosion can quickly climb out of control.

WE ROLL AGAINST THE FLOW

Tensar International Corporation (Tensar) is the world's leading provider of performance-guaranteed erosion control solutions. For more than 25 years, the Tensar® North American Green® line of erosion and sediment control products has kept our customers on solid ground.

The RollMax™ Systems' family of Rolled Erosion Control Products (RECPs) is solid evidence of Tensar's ongoing investment in innovation. Our short-term and long-term erosion control blankets and turf reinforcement mats keep you one step ahead of just about any erosion challenge.

ALL THE HELP YOU NEED

Of all the RECP manufacturers out there, none can match Tensar's customer service and technical knowhow. Our support team will assist with project design and product specification or, if you'd rather do it yourself, use our Erosion Control Materials Design Software (ECMDS®) (the industry's first) for selecting material, and planning your project.

Tensar products are sold exclusively through nearly 200 Tensar Erosion Control authorized distributors worldwide. The Tensar Erosion Solutions Specialist program certifies our distributors and their sales representatives to design erosion control measures that comply with the EPA's National Pollutant Discharge Elimination System (NPDES) and other industry regulations.

Tensar is a proud member of the Erosion Control Technology Council (ECTC) and the International Erosion Control Association (IECA).

NEW NAME – SAME GREAT PERFORMANCE AND SERVICE

Tensar International Corporation acquired North American Green (NAG) in 2004 to enhance our position as the premier provider of technology-driven site solutions. We are proud to continue offering the same NAG level of service, quality and high-performance erosion control products under the name of Tensar.

Site erosion can be costly, with the RollMax Systems full line of rolled erosion control products we can keep you in compliance.

For more than 25 years, our Tensar North American Green line of products has kept our customers on solid ground.

Applications Welcome

For nearly every erosion application, there's a RollMax™ Systems solution. Permanent turf reinforcement mats provide long-term protection and vegetation establishment; temporary Erosion Control Blankets (ECBs) give immediate protection and assist with vegetation establishment before degrading naturally. Tensar's extensive selection of RollMax products almost guarantees you'll find the answer to your erosion problems.

Typical erosion control applications include these and many more:

- Highway and other DOT projects
- Commercial and residential developments
- Shorelines and waterways
- Golf course turf management
- Oil and gas pipeline restoration
- Mine and fire reclamation
- Military base construction

AND SPEAKING OF GUARANTEES . . .

Tensar's Ultimate Assurance Guarantee is the most comprehensive in the industry. It says if any properly specified and installed Tensar® North American Green® rolled erosion control product designed by a qualified engineer or Tensar technical representative in accordance with our Erosion Control Materials Design Software (ECMDS®) fails to perform under the conditions in the Guarantee, then we will replace the failed product with our next higher-performance RECP product, along with the cost of seed, fertilizer, topsoil and other amendments lost due to such product failure. Our Guarantee warrants in accordance with its terms and conditions all registered projects designed with the latest version of our ECMDS and properly installed.

Tensar turf reinforcement mats are also guaranteed to reinforce vegetation for five years after installation, and the functional longevity of these products' permanent structures is warranted for a minimum of 10 years after installation, subject to the terms and conditions set forth in the Guarantee.

From challenging roadway improvements to concentrated flow channels, there is a RollMax product ready to handle the job – and it's guaranteed.

Permanent RollMax™ Solutions

Back in the day, rock riprap, articulated concrete blocks and poured concrete were the only way to deal with erosion in high-flow channels, on shorelines and other areas where water and/or wind exceed the shear limits of unreinforced vegetation.

Not anymore. Tensar's permanent Turf Reinforcement Mats (TRMs) use 100% synthetic components or a composite of synthetic and natural materials for long-term erosion protection and vegetation establishment. Whether compared to rock riprap or concrete, the RollMax™ Systems' permanent TRMs offer a number of significant advantages:

- Prevent loss of precious topsoil to wind and water erosion
- Permanently reinforce vegetation root and stem structures
- Provide excellent conditions for quick, healthy vegetation growth
- Stabilize slopes from erosion to keep roadways safe and clean
- Protect water quality in lakes, rivers and streams
- Protect dormant seeding during winter months
- Easily conform to landscape features
- Lightweight for easy handling and transportation

VMAX® COMPOSITE TURF REINFORCEMENT MATS

VMax® C-TRMs combine three-dimensional matting with fiber matrix material for permanent erosion control on severe slopes, spillways, stream banks, shorelines and in high- to extreme-flow channels. These extensively tested products provide maximum performance through all three phases of reinforced vegetative lining development: unvegetated, establishment, and maturity. Incorporating the best performance features of temporary and permanent Tensar erosion control products, VMax C-TRMs deliver these tangible benefits:

- Surface-applied for the highest level of immediate soil protection
- Less than one third of the installed cost of rock or concrete
- No heavy equipment needed to install
- More attractive and effective "Green" alternative than rock riprap or concrete
- Exceeds FHWA and ECTC standards for TRMs
- An EPA Best Management Practice (BMP) for National Pollutant Discharge Elimination System (NPDES) regulations
- No threat to pedestrians or automobiles when used near travel routes
- Naturally filters runoff water

The TRMs easily conform to various landscape features to prevent the loss of precious topsoil.

The RollMax TRMs are installed in a one-step operation directly over the prepared seedbed saving time and money and ensuring the highest level of erosion control and vegetation reinforcement.

VMax® P550® Permanent TRM

Our top of the line P550® TRM has a polypropylene fiber matrix augmenting the permanent netting structure with permanent mulching and erosion control performance. Unvegetated, the P550 TRM reduces soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 4.0 lbs/ft^2 (191 Pa). The ultra-strong structure drives the vegetated shear resistance up to 14 lbs/ft^2 (672 Pa), establishing a new maximum for vegetation reinforcement. The P550 TRM may be used as an alternative for poured concrete or articulated concrete blocks in extreme erosion control projects.

VMax® C350® Permanent TRM

A 100% coconut fiber matrix supplements the C350's permanent three-dimensional netting structure with initial mulching and erosion control performance for up to 36 months. Unvegetated, the C350® TRM reduces soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.2 lbs/ft^2 (153 Pa) and boosts permanent vegetation performance up to 12 lbs/ft^2 (576 Pa). This environmentally friendly alternative to 30 in. (76 cm) or larger rock riprap is ideal for severe erosion control projects.

VMax® SC250® Permanent TRM

The SC250® permanent TRM has a 70% straw/30% coconut fiber matrix to enhance initial mulching and erosion control performance for up to 24 months. Unvegetated, SC250 TRMs reduce soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.0 lbs/ft^2, and increases permanent vegetation performance up to 10 lbs/ft^2 (480 Pa) for a green alternative to rock riprap.

ERONET™ PERMANENT EROSION CONTROL BLANKETS

The EroNet™ Permanent ECB provides immediate erosion protection and vegetation establishment assistance until vegetation roots and stems mature.

EroNet™ P300® Permanent Erosion Control Blankets

The P300® permanent erosion control blanket consists of UV-stabilized polypropylene fiber stitched between heavy-weight UV-stabilized polypropylene top and bottom nets. These mats reduce soil loss and protect vegetation from being washed away or uprooted, even under high stress. Unvegetated, they reduce soil loss to less than 0.5 in. (12.7 mm) under shear stress up to 3.0 lbs/ft^2 (144 Pa), and protect vegetation from being washed away or uprooted when exposed to shear stresses up to 8 lbs/ft^2 (383 Pa).

To boost performance of the VMax turf reinforcement mats in critical applications, combine with our ShoreMax® flexible transition mat to create a system that can dramatically elevate the permissible shear stress and velocity protection beyond many hard armor solutions.

VMax Mats are perfect for pipe outlets, channel bottoms, shoreline transition zones, and other areas subjected to highly turbulent water flows.

Temporary RollMax™ Solutions

Erosion control has never been so simple yet effective. Tensar's RollMax™ temporary Erosion Control Blankets (ECBs) provide immediate erosion protection and vegetation establishment assistance, then degrade once the vegetation's root and stem systems are mature enough to stabilize the soil.

Our high-quality temporary solutions are available in varying functional longevities and materials:

- Short-term photodegradable blankets with a functional longevity of 45 days up to 12 months
- Extended-term and long-term photodegradable blankets for protection up to 36 months
- Short-term biodegradable blankets for protection up to 12 months
- Extended-term and long-term biodegradable products for protection and mulching from 18 to 24 months

ERONET™ EROSION CONTROL BLANKETS

Tensar's EroNet™ ECBs incorporate photodegradable nettings, which means they are broken down by the ultraviolet rays in sunlight. These temporary products can be used in a variety of scenarios, including moderate to steep slopes, medium- to high-flow channels, shorelines and other areas needing protection until permanent vegetation establishment.

EroNet™ C125® Long-Term Photodegradable Double-Net Coconut Blanket

The C125® ECB is made of 100% coconut fiber stitched between heavyweight UV-stabilized polypropylene nets. It offers excellent durability, erosion control and longevity for severe slopes, steep embankments, high-flow channels and other areas where vegetation may take up to 36 months to grow in.

The EroNet temporary ECBs are designed to provide immediate erosion protection and vegetation establishment assistance, and then degrade after the vegetation is mature enough to permanently stabilize the underlying soil. Both short-term and extended-term ECBs are available.

EroNet™ SC150® Extended-Term Photodegradable Double-Net Straw/Coconut Blanket

With a layer of 70% straw and 30% coconut fiber stitched between a heavyweight UV-stabilized polypropylene top net and a lightweight photodegradable polypropylene bottom net, the SC150® ECB has increased durability, erosion control capabilities and longevity. It is suitable for steeper slopes, medium-flow channels and other areas where it may take vegetation up to 24 months to grow in.

EroNet™ S150® Short-Term Photodegradable Double-Net Straw Blanket

The S150 ECB is made with a 100% straw fiber matrix stitched between lightweight photodegradable polypropylene top and bottom nets. The S150 ECB's double-net construction has greater structural integrity than single net blankets for use on steeper slopes and in channels with moderate water flow. It provides erosion protection and mulching for up to 12 months.

EroNet™ DS150™ Ultra Short-Term Photodegradable Double-Net Straw Blanket

The DS150™ ECB is suitable for high maintenance areas where close mowing will occur soon after installation. Special additives in the thread and top and bottom net ensure it degrades in adequate sunlight within 60 days.

EroNet™ S75® Short-Term Photodegradable Single-Net Straw Blanket

The S75® ECB protects and mulches moderate slopes and low-flow channels in low maintenance areas for up to 12 months. It is constructed of 100% straw fiber stitched with degradable thread to a lightweight photodegradable polypropylene top net.

EroNet™ DS75™ Ultra Short-Term Photodegradable Single-Net Straw Blanket

Designed for high maintenance areas where close mowing will occur soon after installation, the DS75™ ECB degrades within 45 days because of special additives in the thread and top net that facilitate rapid breakdown in adequate sunlight.

Every site has its own unique characteristics and challenges. EroNet Erosion Control Blankets are available in varying longevities to suit a variety of scenarios and conditions.

With our Erosion Control Materials Design Software (ECMDS), you can select either short-term, extended-term or long-term EroNet blankets based on your specific design needs.

Temporary RollMax™ Solutions

BIONET® EROSION CONTROL BLANKETS

BioNet® 100% biodegradable ECBs provide effective and all-natural erosion control and vegetation establishment in an environmentally and wildlife friendly manner. All products in the line are made of organic, biodegradable materials perfect for bioengineering applications, environmentally sensitive sites, shaded areas, stream banks and shorelines. Other advantages are:

- Little to no risk of wildlife entrapment
- Easy to sprig or plant through
- High durability, fiber retention and mechanical stability with Leno weave technology
- Increased water absorption with jute netting vs. polypropylene netting
- Improved blanket conformance and adherence to soil vs. polypropylene netting
- Enhanced erosion protection and mulching capabilities vs. polypropylene netting
- Durable, flexible and 100% biodegradable
- Lightweight jute netting requires no direct sunlight exposure to initiate degradation

BioNet® C125BN™ Long-Term Biodegradable Double-Net Coconut Blanket

A dense layer of coconut fiber stitched between jute nettings allows the C125BN™ ECB to provide more effective erosion protection and mulch than open weave coir nettings. This product performs in critical applications for up to 24 months.

BioNet® SC150BN™ Extended-Term Biodegradable Double-Net Straw/Coconut Blanket

The SC150BN™ ECB features a layer of 70% straw and 30% coconut fiber stitched between biodegradable jute top and bottom nettings. It provides erosion protection and mulching for up to 18 months in applications requiring extra strength and erosion control properties.

BioNet® S150BN™ Short-Term Biodegradable Double-Net Straw Blanket

The S150BN™ ECB is used for applications requiring greater durability and performance than a single-net biodegradable ECB can provide. Made with a 100% straw fiber matrix stitched between biodegradable jute top and bottom nettings, it offers up to 12 months of erosion protection and mulching action.

BioNet® S75BN™ Short-Term Biodegradable Single-Net Straw Blanket

Consisting of a 100% straw fiber matrix stitched to a biodegradable jute top nettings, the S75BN™ ECB provides better erosion protection and mulching action than conventional open weave jute nettings alone. The S75BN ECB provides up to 12 months of erosion control and vegetation growth support.

Design and Installation Tools

SHIFT, CONTROL, ENTER

Professional guidance on RECP selection, design and project planning is at your fingertips with Tensar's proprietary Erosion Control Materials Design Software (ECMDS®). This web-based program incorporates design methodologies from the Federal Highway Administration and United States Department of Agriculture to analyze your specific site conditions, and make quantified recommendations based on data from controlled laboratory and field research. ECMDS is a must-have if you face tough erosion and sediment control regulations. Best of all, it's free of charge, compliments of Tensar. To learn more and access the software directly, go to **www.ECMDS.com**.

INSTRUCTIONS INCLUDED

Proper anchoring patterns and rates must be used to achieve optimal results in RECP installation. View our installation guides for stapling patterns. Site specific staple pattern recommendations based on soil type and severity of application may be acquired through our ECMDS.

HOLD ON TIGHT

When under the pressure of severe conditions, even the best erosion control products can't function to their full potential without proper installation and anchoring. Tensar supplies a wide variety of fastener options for nearly every application and soil type.

For use in cohesive soils, wire staples are a cost-effective means to fasten RECPs. Available in 6 in., 8 in., 10 in. and 12 in. lengths, our U-shaped staples can reach to various depths to ensure adequate pull-out resistance. For installation using our handy Pin Pounder installation tool, 6 in. V-top staples or 6 in. circle top pins are available.

Our biodegradable BioStakes® are available in 4 in. and 6 in. lengths and provide an environmentally friendly alternative to metal staples. For an even more durable, deeper reaching yet all-natural anchoring option, our wood EcoStakes® are available in 6 in., 12 in., 18 in. and 24 in. lengths.

For severe applications needing the ultimate, long-lasting hold, try our 12 and 18 in. rebar staples, our 12 in. plastic ShoreMax® stakes, or our complete line of percussion earth anchors. The Tensar earth anchors reach deep into the soil strata to offer enhanced anchoring in the worst conditions. Our variety of earth anchors are designed for durability and holding power under extreme hydraulic stresses and adverse soil conditions *(Table 1)*.

For more information on the RollMax Systems or other systems within the Tensar Erosion Control Solutions, call **800-TENSAR-1** or visit **www.tensarcorp.com**.

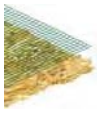
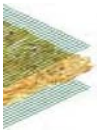
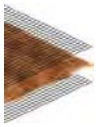
Earth Anchor Options

					EA 400		EA 680	
	Tendon Type (3/32 in. x 36 in.)	**Assembly Description**	**Fast Install**	**Economic Anchor**	**Stainless**	**Galvanized**	**Stainless**	**Galvanized**
End Piece Options with a PVC Face Plate	**Copper Stop Sleeve** with Stainless Steel Washer	Manually crimped to the stainless steel cable to secure the face plate.		X	X		X	
	Grip End Piece with Stainless Steel Washer	Three-dimensional, self-securing metal end piece that does not require manual crimping for tendon tensioning.	X	X	X	X	X	X
	Wedge Grip Piece	Self-securing end piece that installs flush to the face plate. Does not require manual crimping for tendon tensioning.	X		X	X	X	X
	Aluminum Stop Sleeve with Stainless Steel Washer	Manually crimped to the galvanized cable to secure the face plate.		X		X		X

TABLE 1

The complete line of RollMax™ products offers a variety of options for both short-term and permanent erosion control needs. Reference the RollMax Products Chart below to find the right solution for your next project.

RollMax Product Selection Chart

	TEMPORARY						
	ERONET						BIONET
							
	DS75	**DS150**	**S75**	**S150**	**SC150**	**C125**	**S75BN**
Longevity	45 days	60 days	12 mo.	12 mo.	24 mo.	36 mo.	12 mo.
Applications	Low Flow Channels 4:1-3:1 Slopes	Moderate Flow Channels 3:1-2:1 Slopes	Low Flow Channels 4:1-3:1 Slopes	Moderate Flow Channels 3:1-2:1 Slopes	Medium Flow Channels 2:1-1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	Low Flow Channels 4:1-3:1 Slopes
Design Permissible Shear Stress lbs/ft² (Pa)	Unvegetated 1.55 (74)	Unvegetated 1.75 (84)	Unvegetated 1.55 (74)	Unvegetated 1.75 (84)	Unvegetated 2.00 (96)	Unvegetated 2.25 (108)	Unvegetated 1.60 (76)
Design Permissible Velocity ft/s (m/s)	Unvegetated 5.00 (1.52)	Unvegetated 6.00 (1.52)	Unvegetated 5.00 (1.2)	Unvegetated 6.00 (1.83)	Unvegetated 8.00 (2.44)	Unvegetated 10.00 (3.05)	Unvegetated 5.00 (1.52)
Top Net	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft² (4.53 kg/100 m²) approx wt
Center Net	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fiber Matrix	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw/coconut matrix 70% Straw 0.35 lbs/yd² (0.19 kg/m²) 30% Coconut 0.15 lbs/yd² (0.08 kg/m²)	Coconut fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)
Bottom Net	N/A	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	N/A	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	N/A
Thread	Accelerated degradable	Accelerated degradable	Degradable	Degradable	Degradable	UV-stabilized polypropylene	Biodegradable

	TEMPORARY			PERMANENT			
	BIONET			ERONET	VMAX		
	S150BN	**SC150BN**	**C125BN**	**P300**	**SC250**	**C350**	**P550**
Longevity	12 mo.	18 mo.	24 mo.	Permanent	Permanent	Permanent	Permanent
Applications	Moderate Flow Channels 3:1-2:1 Slopes	Medium Flow Channels 2:1-1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	High-Flow Channels 1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	High-Flow Channels 1:1 and Greater Slopes	Extreme High-Flow Channels 1:1 and Greater Slopes
Design Permissible Shear Stress lbs/ft^2 (Pa)	Unvegetated 1.85 (88)	Unvegetated 2.10 (100)	Unvegetated 2.35 (112)	Unvegetated 3.0 (144) Vegetated 8.0 (383)	Unvegetated 3.0 (144) Vegetated 10.0 (480)	Unvegetated 3.2 (153) Vegetated 12.0 (576)	Unvegetated 4.0 (191) Vegetated 14.0 (672)
Design Permissible Velocity ft/s (m/s)	Unvegetated 6.00 (1.83)	Unvegetated 8.00 (2.44)	Unvegetated 10.00 (3.05)	Unvegetated 9.00 (2.7) Vegetated 16.0 (4.9)	Unvegetated 9.5 (2.9) Vegetated 15.0 (4.6)	Unvegetated 10.5 (3.2) Vegetated 20.0 (6.0)	Unvegetated 12.5 (3.8) Vegetated 25.0 (7.6)
Top Net	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft^2 (4.53 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Heavyweight polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Extra heavyweight polypropylene 8.0 lbs/1000 ft^2 (3.91 kg/100 m^2) approx wt	Ultra heavyweight polypropylene 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2) approx wt
Center Net	N/A	N/A	N/A	N/A	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)	Ultra heavyweight polypropylene – corrugated 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2)
Fiber Matrix	Straw fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	Straw/coconut matrix 70% Straw 0.35 lbs/yd^2 (0.19 kg/m^2) 30% Coconut 0.15 lbs/yd^2 (0.08 kg/m^2)	Coconut fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	UV-stabilized polypropylene fiber 0.70 lbs/yd^2 (0.38 kg/m^2)	Straw/coconut matrix 70% Straw 0.35 lbs/yd^2 (0.19 kg/m^2) 30% Coconut 0.15 lbs/yd^2 (0.08 kg/m^2)	Coconut fiber 0.50 lbs/yd^2 (0.27 kg/m^2)	UV-stabilized polypropylene fiber 0.50 lbs/yd^2 (0.27 kg/m^2)
Bottom Net	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Woven. 100% biodegradable jute fiber 7.70 lbs/1000 ft^2 (3.76 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 3.0 lbs/1000 ft^2 (1.47 kg/100 m^2) approx wt	Heavyweight UV-stabilized polypropylene 5.0 lbs/1000 ft^2 (2.44 kg/100 m^2) approx wt	Extra heavyweight polypropylene 8.0 lbs/1000 ft^2 (3.91 kg/100 m^2) approx wt	Ultra heavyweight polypropylene 24.0 lbs/1000 ft^2 (11.7 kg/100 m^2) approx wt
Thread	Biodegradable	Biodegradable	Biodegradable	UV-stabilized polypropylene	UV-stabilized polypropylene	UV-stabilized polypropylene fiber	UV-stabilized polypropylene

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ DS75™ Erosion Control Blanket

DESCRIPTION

The ultra short-term single net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 45 days. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a polypropylene netting having an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographical location and elevation. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The DS75 shall meet Type 1.C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	100% Straw Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Top side only, lightweight photodegradable with photo accelerators	1.5 lb/1000 sq ft (0.73 g/sm)
Thread	Degradable	

Standard Roll Sizes			
Width	6.67 (2.03 m)	8.0 ft (2.4 m)	16 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	40 lbs (18.14 kg)	50 lbs (22.68 kg)	96 lbs (43.54 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.5 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.45 in. (11.43 mm)
Resiliency	ECTC Guidelines	78.8%
Water Absorbency	ASTM D1117	375%
Mass/Unit Area	ASTM 6475	8.57 oz/sy (291 g/sm)
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.31 oz-in
Light Penetration	ASTM D6567	10%
Tensile Strength - MD	ASTM D6818	105.6 lbs/ft (1.57 kN/m)
Elongation - MD	ASTM D6818	34%
Tensile Strength - TD	ASTM D6818	42.0 lbs/ft (0.62 kN/m)
Elongation - TD	ASTM D6818	25.2%
Biomass Improvement	ASTM D7322	286%

Design Permissible Shear Stress	
Unvegetated Shear Stress	1.55 psf (74 Pa)
Unvegetated Velocity	5.00 fps (1.52 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.029	N/A	N/A
20-50 ft	0.11	N/A	N/A
≥ 50 ft (15.2 m)	0.19	N/A	N/A

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.055
0.50 – 2.0 ft	0.055-0.021
≥ 2.0 ft (0.60 m)	0.021

Tensar®
NORTH AMERICAN GREEN®

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Tensar International Corporation warrants that at the time of delivery the product furnished hereunder shall conform to the specification stated herein. Any other warranty including merchantability and fitness for a particular purpose, are hereby executed. If the product does not meet specifications on this page and Tensar is notified prior to installation, Tensar will replace the product at no cost to the customer. **This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped prior to January 1, 2012.**

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ C125® Erosion Control Blanket

DESCRIPTION

The long-term double net erosion control blanket shall be a machine-produced mat of 100% coconut fiber with a functional longevity of up to 36 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in (1.59 x 1.59 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The C125 shall meet Type 4 specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	100% Coconut Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Heavyweight photodegradable with UV additives	3 lbs/1000 sq ft (1.47 g/sm)
Thread	Black polypropylene	

Standard Roll Sizes		
Width	6.67 (2.03 m)	8 ft (2.44 m)
Length	108 ft (32.92 m)	112 ft (35.14 m)
Weight ± 10%	44 lbs (19.95 kg)	56.25 (25.5 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.22 in. (5.59 mm)
Resiliency	ECTC Guidelines	82%
Water Absorbency	ASTM D1117	167%
Mass/Unit Area	ASTM 6475	7.73 oz/sy (262.8 g/sm)
Swell	ECTC Guidelines	13%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	0.75 oz-in
Light Penetration	ASTM D6567	16.6%
Tensile Strength - MD	ASTM D6818	472.8 lbs/ft (7.01 kN/m)
Elongation - MD	ASTM D6818	25.6%
Tensile Strength - TD	ASTM D6818	225.6 lbs/ft (3.35 kN/m)
Elongation - TD	ASTM D6818	33.9%
Biomass Improvement	ASTM 7322	257%

Design Permissible Shear Stress	
Unvegetated Shear Stress	2.25 psf (108 Pa)
Unvegetated Velocity	10.0 fps (3.05 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.029	0.082
20-50 ft	0.036	0.060	0.096
≥ 50 ft (15.2 m)	0.070	0.090	0.110

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.022
0.50 – 2.0 ft	0.022-0.014
≥ 2.0 ft (0.60 m)	0.014

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – VMax® C350® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between super heavy duty UV-stabilized nettings with 0.50 x 0.50 in. (1.27 x 1.27 cm) openings, an ultra heavy duty UV-stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 in. (1.27 x 1.27 cm) openings, and covered by a super heavy duty UV-stabilized nettings with 0.50 x 0.50 in. (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 in. (3.81 cm) centers with UV-stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The C350 shall meet Type 5A, B and C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) *FP-03 Section 713.18*.

Material Content		
Matrix	100% Coconut Fiber	0.5 lb/sy (0.27 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	8 lb/1000 sf (3.91 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	37 lbs (16.8 kg)
Thread	40 sy (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.73 in. (18.54 mm)
Resiliency	ASTM D6524	90%
Density	ASTM D792	0.917 g/cm^3
Mass/Unit Area	ASTM D6566	18.36 oz/sy (624 g/sm)
UV Stability	ASTM D4355/ 1000 HR	86%
Porosity	ECTC Guidelines	99%
Stiffness	ASTM D1388	0.24 in.-lb (275990 mg-cm)
Light Penetration	ASTM D6567	7.2%
Tensile Strength – MD	ASTM D6818	585.8 lbs/ft (8.70 kN/m)
Elongation – MD	ASTM D6818	45.3%
Tensile Strength – TD	ASTM D6818	687.6 lbs/ft (10.20 kN/m)
Elongation – TD	ASTM D6818	19.5%
Biomass Improvement	ASTM D7322	380%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1 Unvegetated	3.2 psf (153 Pa)	3.0 psf (144 Pa)
Phase 2 Partially Veg.	10.0 psf (480 Pa)	10.0 psf (480 Pa)
Phase 3 Fully Veg.	12.0 psf (576 Pa)	10.0 psf (480 Pa)
Unvegetated Velocity	10.5 fps (3.2 m/s)	
Vegetated Velocity	20 fps (6.0 m/s)	

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.0005	0.015	0.043
20-50 ft	0.018	0.031	0.050
≥ 50 ft (15.2 m)	0.035	0.047	0.057

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.041
0.50 – 2.0 ft	0.040-0.013
≥ 2.0 ft (0.60 m)	0.012

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ SC150® Erosion Control Blanket

DESCRIPTION

The extended-term double net erosion control blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 24 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in (1.59 x 1.59 cm) mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The SC150 shall meet Type 3.B specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	70% Straw Fiber 30% Coconut Fiber	0.35 lbs/sq yd (0.19 kg/sm) 0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top: Heavyweight photodegradable with UV additives	3 lbs/1000 sq ft (1.47 kg/100 sm)
	Bottom: lighweight photodegradable	1.5 lb/1000 sq ft (0.73 kg/100 sm)
Thread	Degradable	

Standard Roll Sizes			
Width	6.67 ft (2.03 m)	8 ft (2.4 m)	16.0 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	44 lbs (19.95 kg)	55 lbs (24.95 kg)	105.6 lbs (47.9 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.6 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.35 in. (8.89 mm)
Resiliency	ECTC Guidelines	75%
Water Absorbency	ASTM D1117	342%
Mass/Unit Area	ASTM D6475	7.87 oz/sy (267.6 g/sm)
Swell	ECTC Guidelines	30%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	1.11 oz-in
Light Penetration	ASTM D6567	6.2%
Tensile Strength - MD	ASTM D6818	362.4 lbs/ft (5.37 kN/m)
Elongation - MD	ASTM D6818	29.4%
Tensile Strength - TD	ASTM D6818	136.8 lbs/ft (2.03 kN/m)
Elongation - TD	ASTM D6818	27.6%
Biomass Improvement	ASTM D7322	481%

Design Permissible Shear Stress	
Unvegetated Shear Stress	2.00 psf (96 Pa)
Unvegetated Velocity	8.0 fps (2.44 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.048	0.100
20-50 ft	0.051	0.079	0.145
≥ 50 ft (15.2 m)	0.10	0.110	0.190

NTPEP Large-Scale Slope
ASTM D6459 - C-factor = 0.031

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.050
0.50 – 2.0 ft	0.050-0.018
≥ 2.0 ft (0.60 m)	0.018

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – VMax® SC250® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 70% straw and 30% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The SC250 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	70% Straw Fiber	0.35 lb/sq yd (0.19 kg/sm)
	30% Coconut Fiber	0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	5 lb/1000 sq ft (2.44 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	34 lbs (15.42 kg)
Area	40 sq yd (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.62 in. (15.75 mm)
Resiliency	ASTM 6524	95.2%
Density	ASTM D792	0.891 g/cm^3
Mass/Unit Area	ASTM 6566	16.13 oz/sy (548 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	99%
Stiffness	ASTM D1388	222.65 oz-in.
Light Penetration	ASTM D6567	4.1%
Tensile Strength – MD	ASTM D6818	709 lbs/ft (10.51 kN/m)
Elongation – MD	ASTM D6818	23.9%
Tensile Strength – TD	ASTM D6818	712 lbs/ft (10.56 kN/m)
Elongation – TD	ASTM D6818	36.9%
Biomass Improvement	ASTM D7322	441%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1: Unvegetated	3.0 psf (144 Pa)	2.5 psf (120 Pa)
Phase 2: Partially Veg.	8.0 psf (383 Pa)	8.0 psf (383 Pa)
Phase 3: Fully Veg.	10.0 psf (480 Pa)	8.0 psf (383 Pa)
Unvegetated Velocity	9.5 fps (2.9 m/s)	
Vegetated Velocity	15 fps (4.6 m/s)	

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.0010	0.0209	0.0507
20-50 ft	0.0081	0.0266	0.0574
≥ 50 ft (15.2 m)	0.0455	0.0555	0.081

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.040
0.50 – 2.0 ft	0.040-0.012
≥ 2.0 ft (0.60 m)	0.011

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Specification Sheet – VMax® P550® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% UV stable polypropylene fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The P550 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	100% UV stable polypropylene fiber	0.5 lb/sy (0.27 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	52 lbs (23.59 kg)
Area	40 sy (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.72 in. (18.29 mm)
Resiliency	ASTM 6524	95%
Density	ASTM D792	0.892 g/cm^3
Mass/Unit Area	ASTM 6566	21.25 oz/sy (723 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	96%
Stiffness	ASTM D1388	366.3 oz-in.
Light Penetration	ASTM D6567	16.5%
Tensile Strength – MD	ASTM D6818	1421 lbs/ft (21.07 kN/m)
Elongation – MD	ASTM D6818	40.5%
Tensile Strength – TD	ASTM D6818	1191.6 lbs/ft (17.67 kN/m)
Elongation – TD	ASTM D6818	28.8%
Biomass Improvement	ASTM D7322	378%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1: Unvegetated	4.0 psf (191 Pa)	3.25 psf (156 Pa)
Phase 2: Partially Veg.	12.0 psf (576 Pa)	12.0 psf (576 Pa)
Phase 3: Fully Veg.	14.0 psf (672 Pa)	12.0 psf (576 Pa)
Unvegetated Velocity	12.5 fps (3.8 m/s)	
Vegetated Velocity	25 fps (7.6 m/s)	

NTPEP ASTM D6460 Large Scale Channel	
Vegetated Shear Stress	>13.2 psf (632 Pa)
Vegetated Velocity	>24.5 fps (7.47 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.0005	0.015	0.043
20-50 ft	0.0173	0.031	0.050
≥ 50 ft (15.2 m)	0.035	0.047	0.057

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.041
0.50 – 2.0 ft	0.040-0.013
≥ 2.0 ft (0.60 m)	0.013

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Specification Sheet – VMax® W3000™ High-Performance Turf Reinforcement Mat

DESCRIPTION

The VMax® W3000™ high performance turf reinforcement mat (HPTRM) is a machine-produced mat of 100% UV-stabilized high denier poly yarns woven into permanent, high strength three-dimensional turf reinforcement matting. The mat consists of a woven bottom layer integrally interlaced into a woven corrugated middle layer, with poly tendons on the top side spanning the entire machine direction. The mat is designed to provide sufficient thickness, optimum open area and three-dimensionality for effective erosion control and vegetation reinforcement against high flow induced shear forces. The mat has high tensile strength providing excellent damage resistance and increased bearing capacity of vegetated soils subject to heavy loads from maintenance equipment and other vehicular traffic. The corrugated structure provides a highly frictional surface to prevent sod slippage when sod is installed over the mat. When used as surface protection without sod overlay, the corrugated structure encapsulates the seed and soil in place while promoting self-soil infilling of the system.

Material Content		
Bottom	100% UV stable poly fiber weave	Black/Green
Corrugated Middle	100% UV stable poly fiber weave	Black/Green
Top	100% UV stable Poly Tendons	Green

Standard Roll Sizes	
Width	10 ft (3.05 m)
Length	90 ft (27.4 m)
Weight ± 10%	90 lbs (41.0 kg)
Area	100 sy (83.6 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.40 in. (10.2 mm)
Resiliency	ASTM D6524	98%
Mass/Unit Area	ASTM 6566	14.7oz/sy (495 g/m2)
Tensile Strength - MD	ASTM D6818	3600 lbs/ft (52.6 kN/m)
Elongation - MD	ASTM D6818	35%*
Tensile Strength - TD	ASTM D6818	3800 lbs/ft (55.5 kN/m)
Elongation - TD	ASTM D6818	20%*
Light Penetration	ASTM D6567	12%
UV Stability	ASTM D4355	>80% @3000 hrs

** Measured on fabric prior to corrugation for true measurement of base fabric elongation*

Design Permissible Shear Stress*	
Vegetated Shear Stress	16 psf (766 Pa)
Vegetated Velocity	25 fps (7.6 m/s)

**Values extrapolated through ASTM D6460 testing*

ASTM D6460 Large Scale Channel	
Vegetated Shear Stress	>13.2 psf (632 Pa)
Vegetated Velocity	>24.5 fps (7.47 m/s)

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ATTACHMENT 4.3
OUTLET BASIN DESIGN WORKSHEET

LEIDY SOUTH PROJECT

COMPRESSOR STATION 620

OUTLET BASIN DESIGN FOR SED BASIN/WET POND OUTLET

PIPE DIAMETER, D (IN)	FLOW, Q (CFS)	OUTLET BASIN WIDTH, W (FT)	OUTLET BASIN LENGTH, L (FT)	OUTLET BASIN DEPTH (FT)	RIPRAP ROCK SIZE	ROCK THICKNESS (IN)	VELOCITY CHECK (FPS)
15	2.02	32	192.00	1.00	R-3	9	2.49

Weir Flow Equation Used for finding head above crest:

Q=C*L*H^1.5

where Q= flow (cfs)

C= weir coefficient (3.0)

L= Crest Length (ft)

H= Head above crest (ft)

Velocity over weir, v (in fps) = sqrt (2gH), where g= 32.17 fps

From E&S Manual,

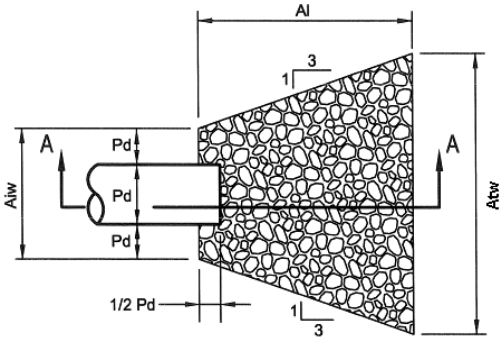
Outlet Basin Length = 6x pipe Diameter

Desirable velocity for downslope grass cover = 2.5 fps

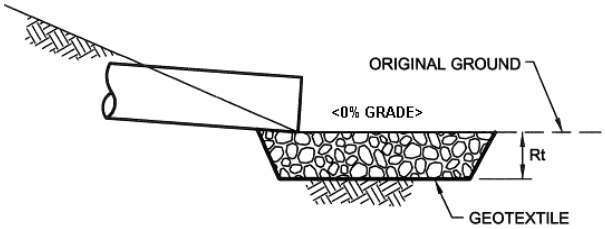
ATTACHMENT 4.4
RIPRAP APRON DESIGN WORKSHEET

STANDARD E&S WORKSHEET # 20
Riprap Apron Outlet Protection

PROJECT NAME: Leidy South – Compressor Station 620
LOCATION: Hensel Replacement – Comrpessor Station 620
PREPARED BY: FPV DATE: 5/26/2020
CHECKED BY: KCC DATE: 5/26/2020



PLAN VIEW

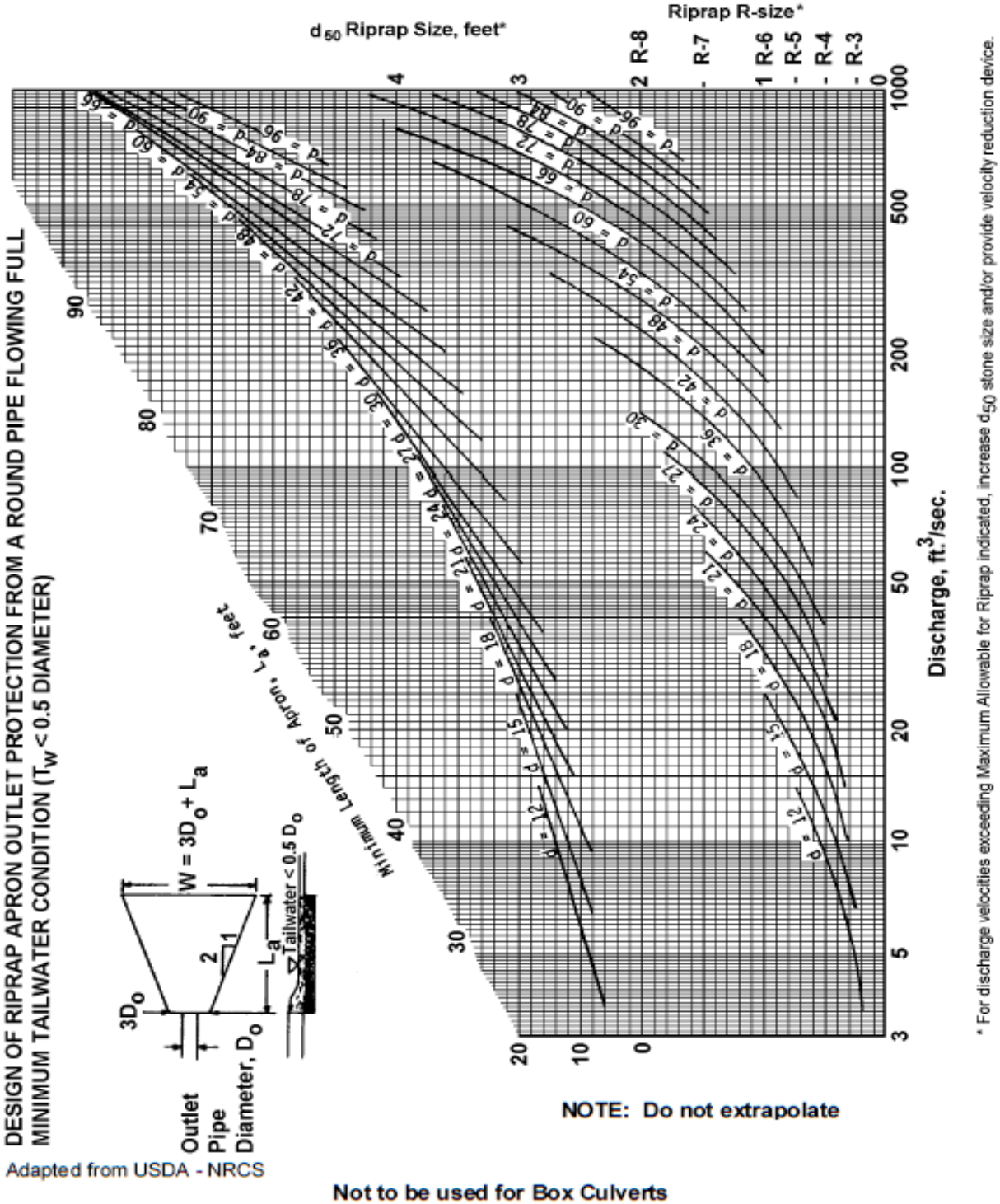


SECTION A - A

NO.	PIPE DIA. Do (in.)	TAIL WATER COND. (Max or Min)	MAN. "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
CULVERT #1 OUTLET	24	Min	0.012	0.016	1.94	0.62	R-4	18	12	6	18
CULVERT #2 OUTLET	24	Min	0.012	0.028	2.94	0.94	R-4	18	12	6	18
CULVERT #3 OUTLET	18	Min	0.012	0.027	0.22	0.12	R-3	9	8	4.5	12
CULVERT #4 OUTLET	18	Min	0.012	0.019	6.73	2.12	R-3	9	8	4.5	12
CULVERT #5 OUTLET	18	Min	0.012	0.019	2.24	1.25	R-3	9	8	4.5	12
CULVERT #6 OUTLET	18	Min	0.012	0.009	6.04	1.90	R-3	9	8	4.5	12
CHANNEL #9 OUTLET	24	Min	0.058	0.050	2.79	1.10	R-4	18	12	6	18

***:The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning's equation to calculate velocity for pipe slopes ≥ 0.05 ft/ft.**

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

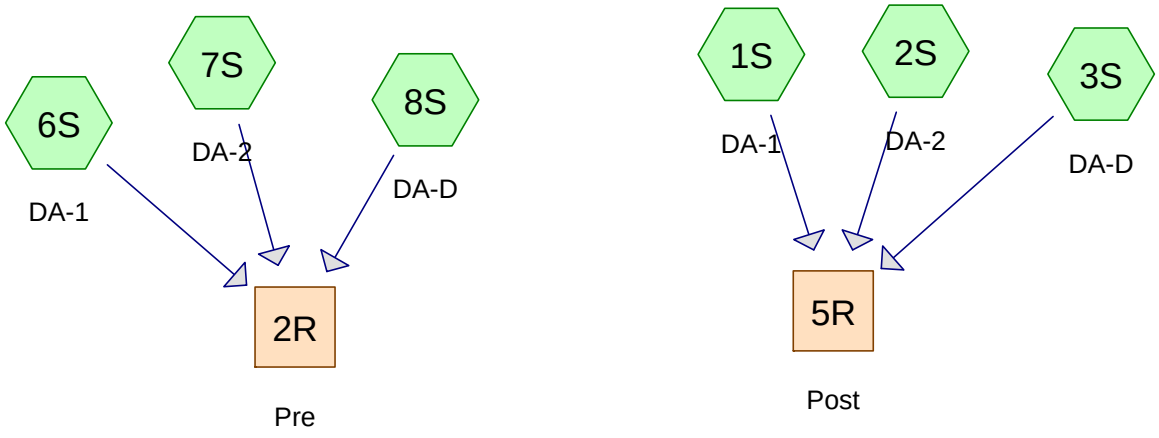
Not to be used for Box Culverts

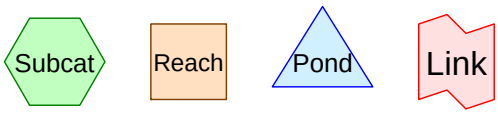
ATTACHMENT 4.5
CULVERT SCHEDULE

CS620 Culvert Schedule

I.D.	Drainage Area [ac]	Req'd Flow [cfs]	Length (ft)	Inlet Invert (ft)	Outlet Invert (ft)	Slope [ft/ft]	No. of Pipes	Pipe Diameter [in]
CULVERT #1	2.15	1.94	63.5	834.0	833.0	0.016	1	24
CULVERT #2	5.02	2.94	35.25	832.0	831.0	0.028	1	24
CULVERT #3	2.87	0.22	56.25	831.5	830.0	0.027	1	18
CULVERT #4	0.97	6.73	46.07	835.0	834.0	0.019	1	18
CULVERT #5	0.32	2.24	40.92	835.0	834.0	0.019	1	18
CULVERT #6	0.88	6.04	29.40	836.0	835.5	0.009	1	18

ATTACHMENT 4.6
HYDROCAD REPORT





Routing Diagram for Compressor Station 620A_Pre&Post
Prepared by {enter your company name here}, Printed 5/29/2020
HydroCAD® 10.00-20 s/n 09710 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
165,893	89	Gravel, HSG A (1S, 2S)
2,080,861	30	Meadow, non-grazed, HSG A (3S, 8S)
1,361,541	58	Meadow, non-grazed, HSG B (1S, 2S, 6S, 7S)
6,812	98	Unconnected roofs, HSG A (1S, 6S)
3,615,107	**43**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
2,253,566	HSG A	1S, 2S, 3S, 6S, 8S
1,361,541	HSG B	1S, 2S, 6S, 7S
0	HSG C	
0	HSG D	
0	Other	
3,615,107		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatc Number
165,893	0	0	0	0	165,893	Gravel	
2,080,861	1,361,541	0	0	0	3,442,402	Meadow, non-grazed	
6,812	0	0	0	0	6,812	Unconnected roofs	
2,253,566	**1,361,541**	**0**	**0**	**0**	**3,615,107**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1S	0.00	0.00	50.0	0.0140	0.012	16.0	0.0	0.0

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>0.16"
Flow Length=1,175' Tc=20.1 min UI Adjusted CN=60 Runoff=0.47 cfs 3,339 cf

Subcatchment 2S: DA-2 Runoff Area=571,253 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=66 Runoff=2.71 cfs 14,783 cf

Subcatchment 3S: DA-D Runoff Area=25.670 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=471' Slope=0.0600 '/' Tc=8.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment 6S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>0.13"
Flow Length=1,174' Tc=20.7 min UI Adjusted CN=58 Runoff=0.25 cfs 2,544 cf

Subcatchment 7S: DA-2 Runoff Area=475,165 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=58 Runoff=0.43 cfs 4,910 cf

Subcatchment 8S: DA-D Runoff Area=22.100 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,189' Tc=16.3 min CN=30 Runoff=0.00 cfs 0 cf

Reach 2R: Pre Inflow=0.65 cfs 7,454 cf
Outflow=0.65 cfs 7,454 cf

Reach 5R: Post Inflow=3.13 cfs 18,122 cf
Outflow=3.13 cfs 18,122 cf

Total Runoff Area = 3,615,107 sf Runoff Volume = 25,576 cf Average Runoff Depth = 0.08"
99.81% Pervious = 3,608,295 sf 0.19% Impervious = 6,812 sf

Summary for Subcatchment 1S: DA-1

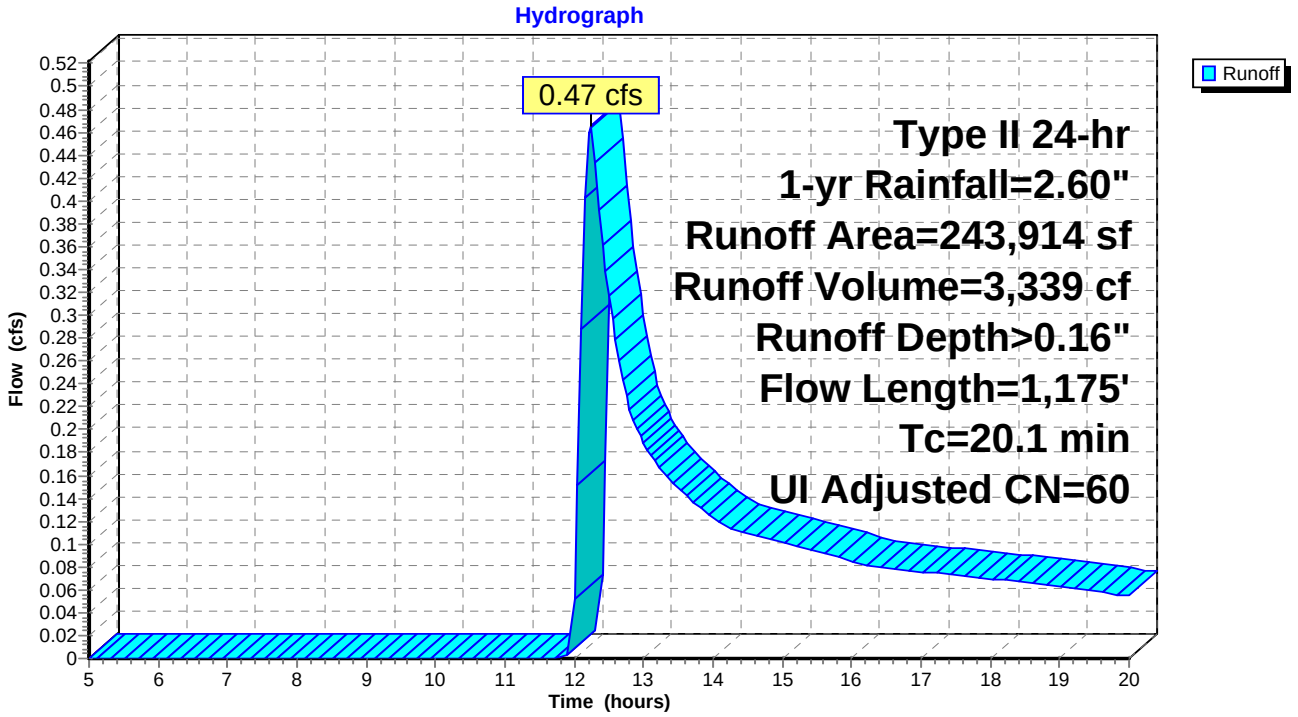
Runoff = 0.47 cfs @ 12.23 hrs, Volume= 3,339 cf, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.60"

	Area (sf)	CN	Adj	Description
	223,296	58		Meadow, non-grazed, HSG B
*	17,212	89		Gravel, HSG A
	3,406	98		Unconnected roofs, HSG A
	243,914	61	60	Weighted Average, UI Adjusted
	240,508			98.60% Pervious Area
	3,406			1.40% Impervious Area
	3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	50	0.0140	7.04	9.84	**Pipe Channel, Culvert** 16.0" Round Area= 1.4 sf Perim= 4.2' r= 0.33' n= 0.012 Concrete pipe, finished
1.6	111	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.1	1,175	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

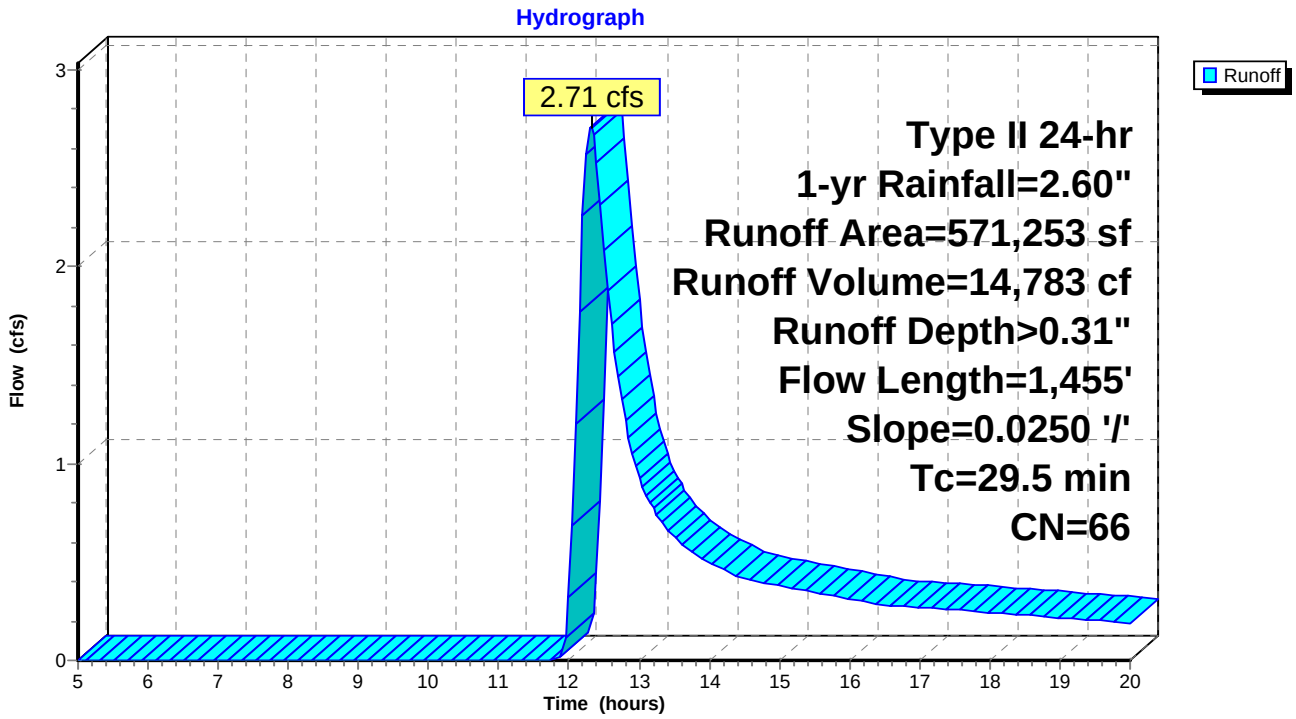
Runoff = 2.71 cfs @ 12.32 hrs, Volume= 14,783 cf, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.60"

	Area (sf)	CN	Description
	422,572	58	Meadow, non-grazed, HSG B
*	148,681	89	Gravel, HSG A
	571,253	66	Weighted Average
	571,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-D

[45] Hint: Runoff=Zero

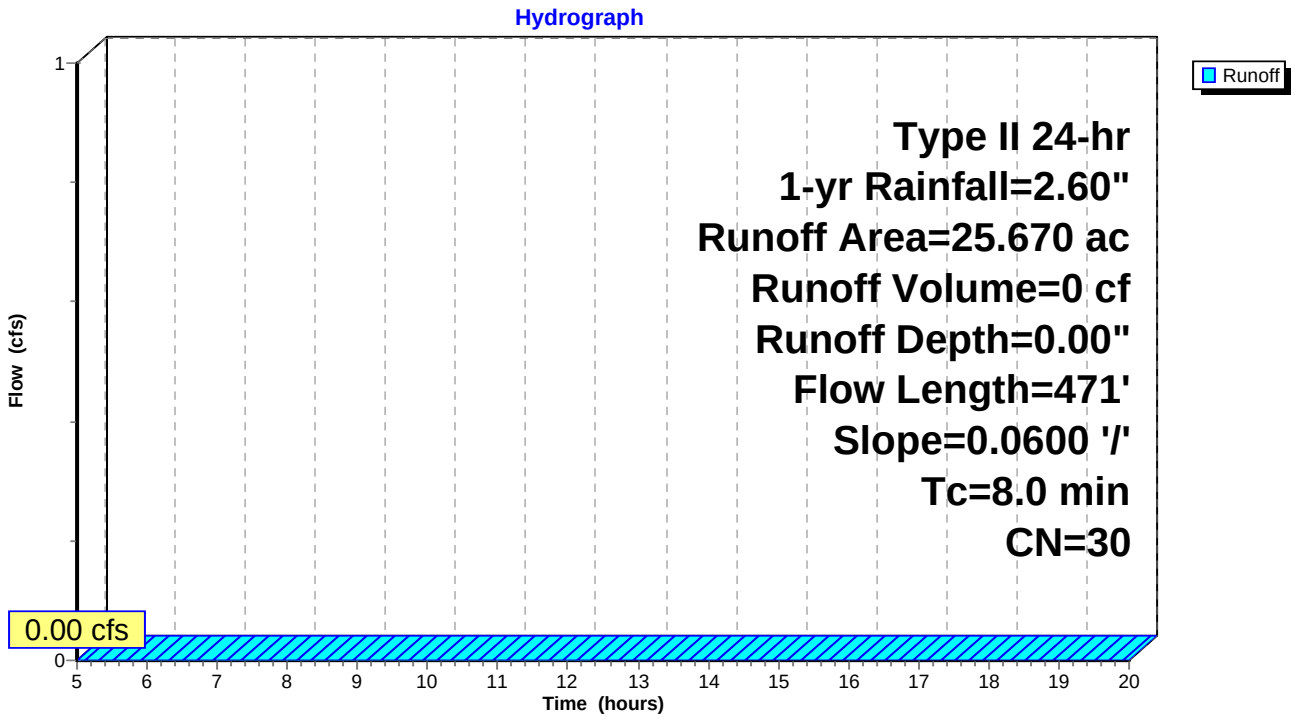
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.60"

Area (ac)	CN	Description
25.670	30	Meadow, non-grazed, HSG A
25.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0600	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
1.6	371	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	471	Total			

Subcatchment 3S: DA-D



Summary for Subcatchment 6S: DA-1

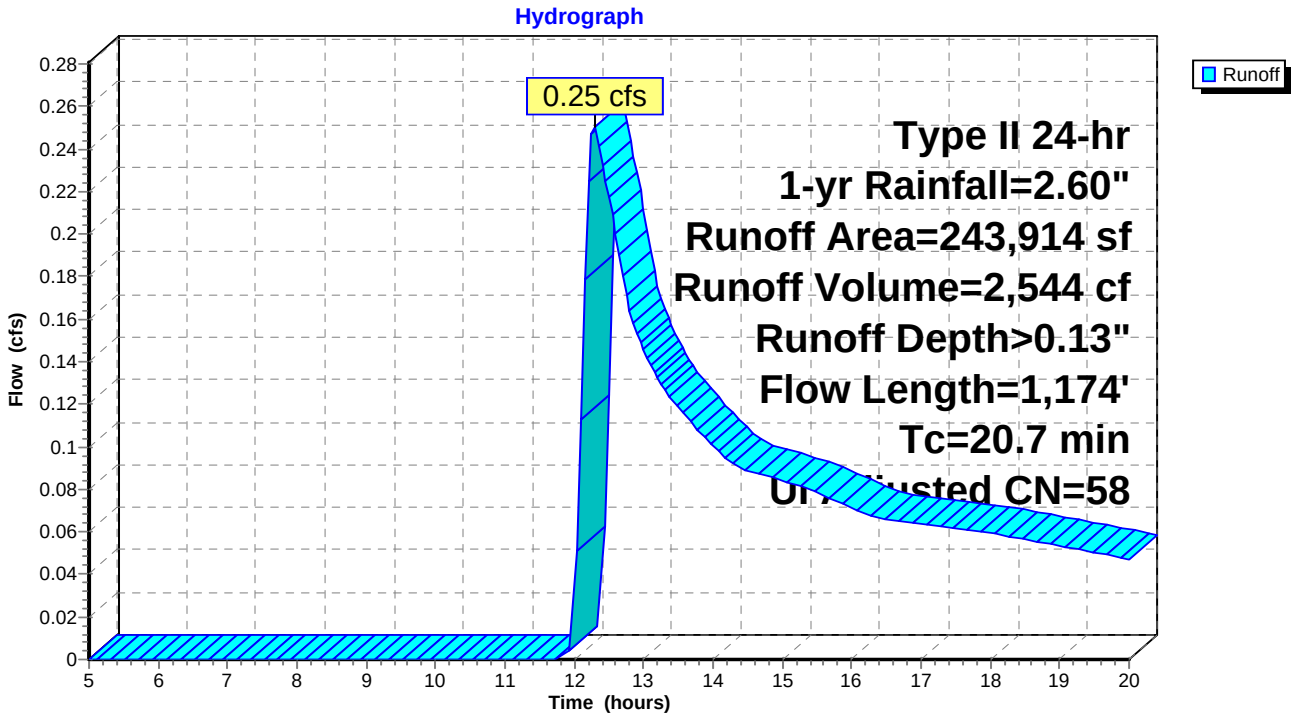
Runoff = 0.25 cfs @ 12.29 hrs, Volume= 2,544 cf, Depth> 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.60"

Area (sf)	CN	Adj	Description
240,508	58		Meadow, non-grazed, HSG B
3,406	98		Unconnected roofs, HSG A
243,914	59	58	Weighted Average, UI Adjusted
240,508			98.60% Pervious Area
3,406			1.40% Impervious Area
3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	160	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.7	1,174	Total			

Subcatchment 6S: DA-1



Summary for Subcatchment 7S: DA-2

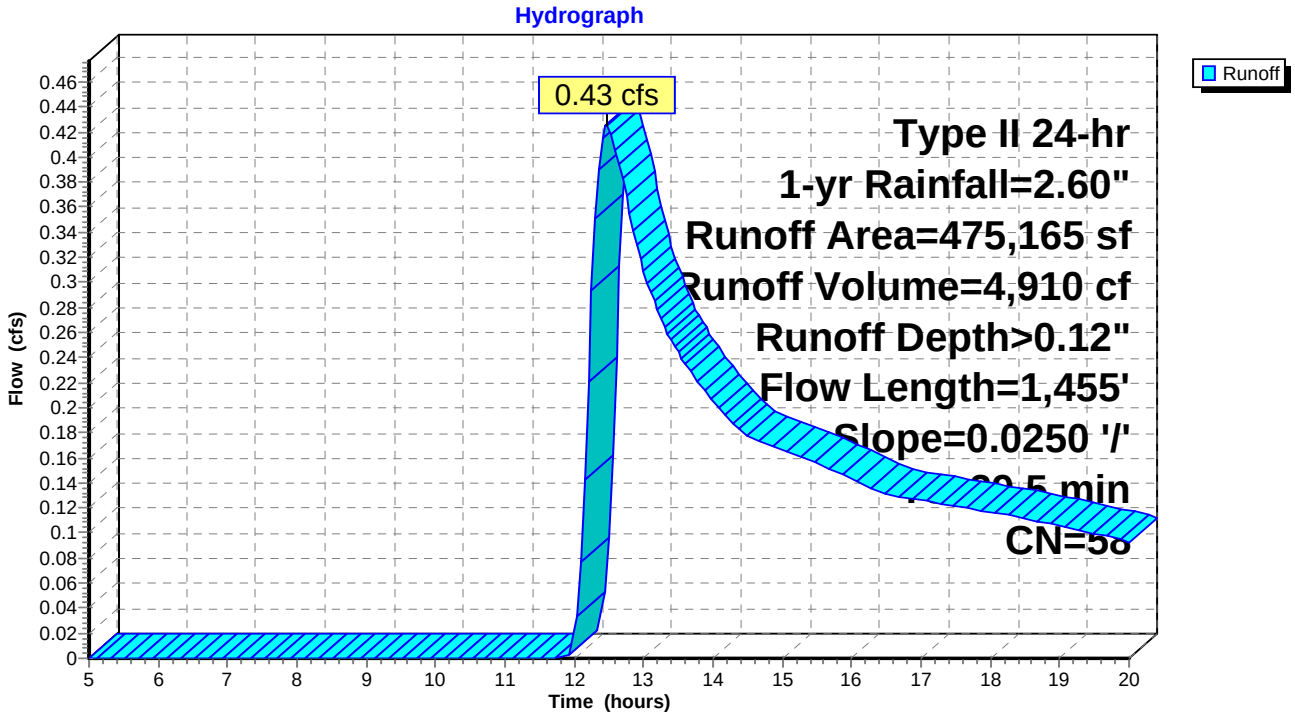
Runoff = 0.43 cfs @ 12.47 hrs, Volume= 4,910 cf, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.60"

Area (sf)	CN	Description
475,165	58	Meadow, non-grazed, HSG B
475,165		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 7S: DA-2



Summary for Subcatchment 8S: DA-D

[45] Hint: Runoff=Zero

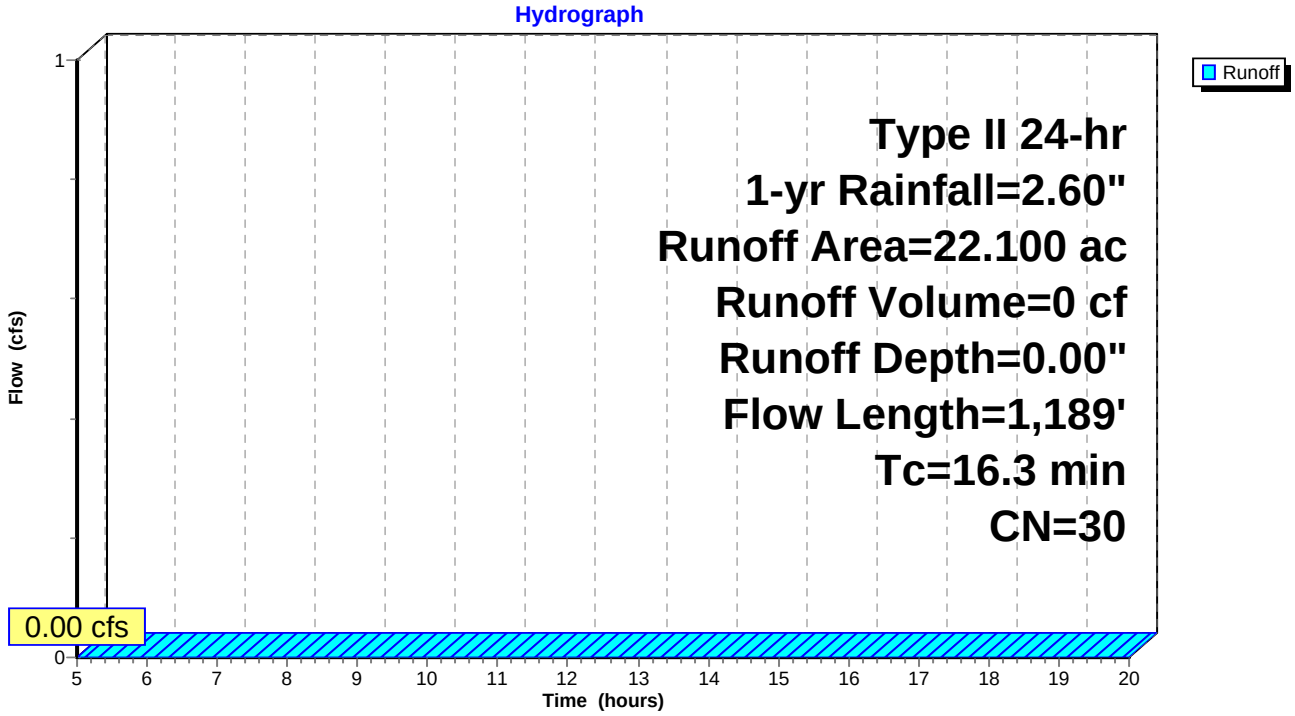
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.60"

Area (ac)	CN	Description
22.100	30	Meadow, non-grazed, HSG A
22.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
4.4	425	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	664	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.3	1,189	Total			

Subcatchment 8S: DA-D



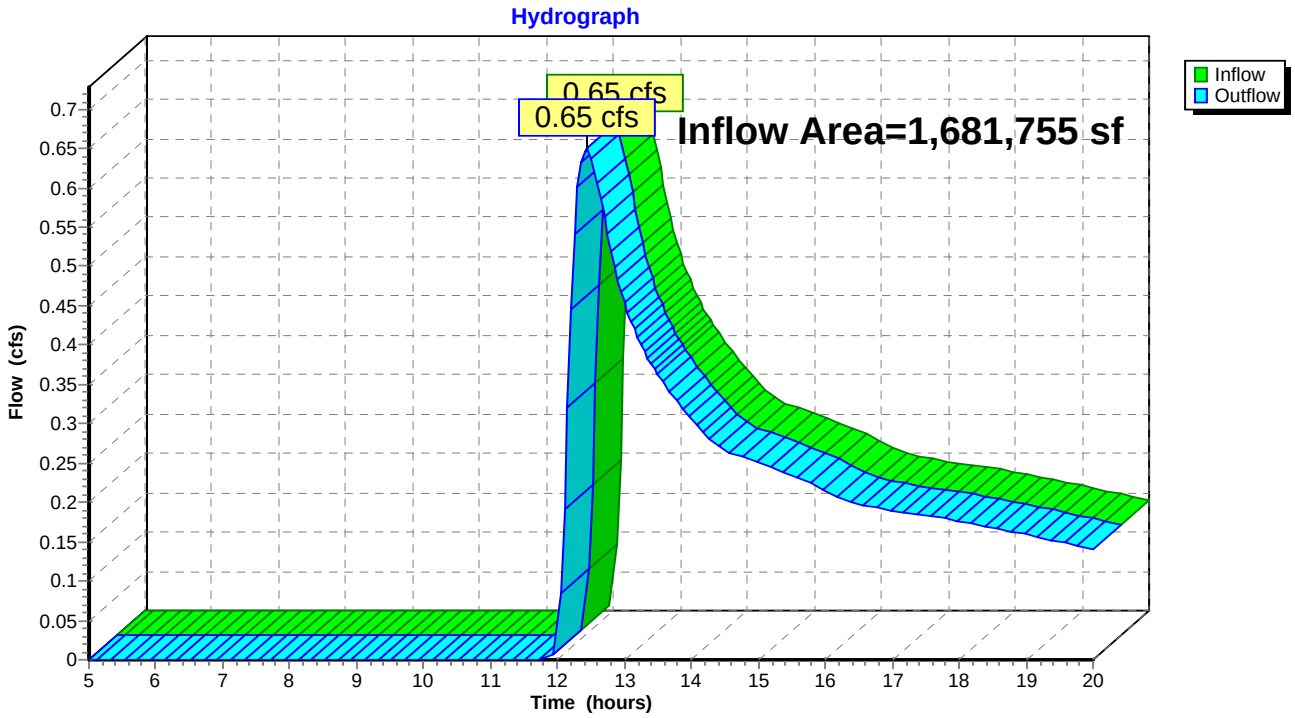
Summary for Reach 2R: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,681,755 sf, 0.20% Impervious, Inflow Depth > 0.05" for 1-yr event
Inflow = 0.65 cfs @ 12.44 hrs, Volume= 7,454 cf
Outflow = 0.65 cfs @ 12.44 hrs, Volume= 7,454 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Pre



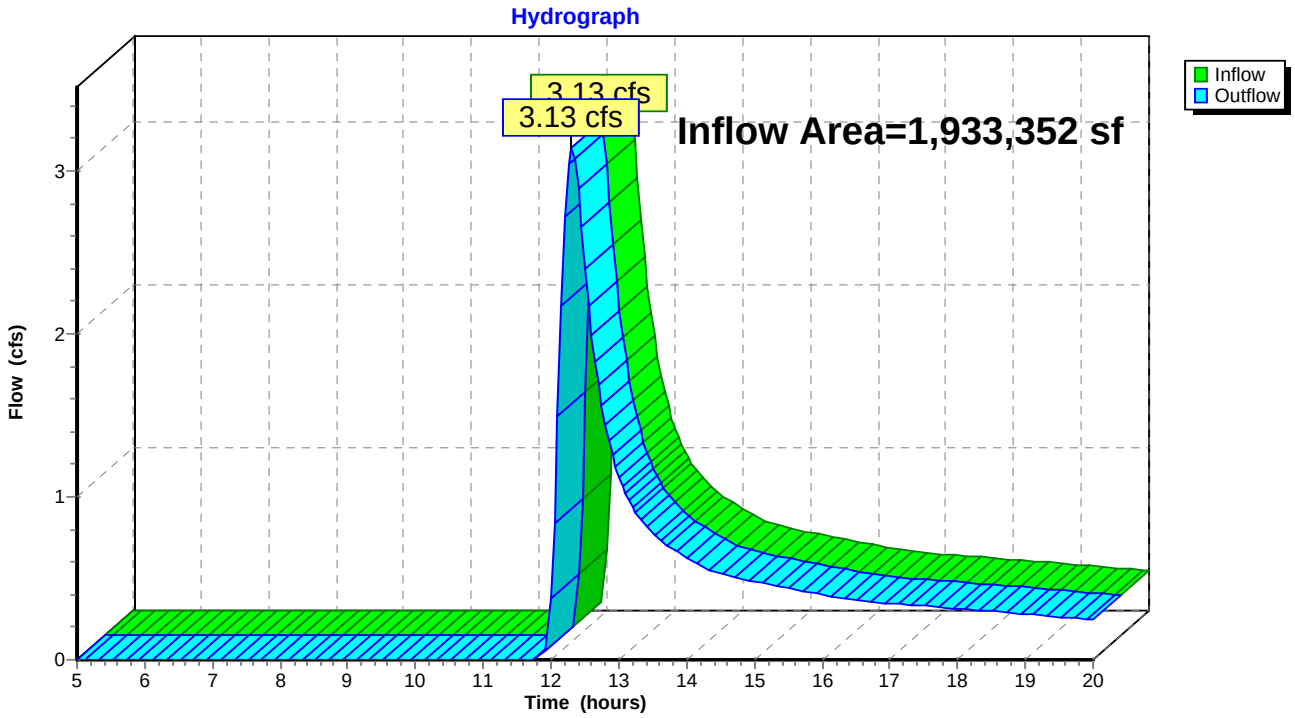
Summary for Reach 5R: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,933,352 sf, 0.18% Impervious, Inflow Depth > 0.11" for 1-yr event
Inflow = 3.13 cfs @ 12.30 hrs, Volume= 18,122 cf
Outflow = 3.13 cfs @ 12.30 hrs, Volume= 18,122 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Post



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>0.32"
Flow Length=1,175' Tc=20.1 min UI Adjusted CN=60 Runoff=1.38 cfs 6,473 cf

Subcatchment 2S: DA-2 Runoff Area=571,253 sf 0.00% Impervious Runoff Depth>0.52"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=66 Runoff=5.35 cfs 24,851 cf

Subcatchment 3S: DA-D Runoff Area=25.670 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=471' Slope=0.0600 '/' Tc=8.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment 6S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>0.26"
Flow Length=1,174' Tc=20.7 min UI Adjusted CN=58 Runoff=0.95 cfs 5,293 cf

Subcatchment 7S: DA-2 Runoff Area=475,165 sf 0.00% Impervious Runoff Depth>0.26"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=58 Runoff=1.47 cfs 10,237 cf

Subcatchment 8S: DA-D Runoff Area=22.100 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,189' Tc=16.3 min CN=30 Runoff=0.00 cfs 0 cf

Reach 2R: Pre Inflow=2.27 cfs 15,530 cf
Outflow=2.27 cfs 15,530 cf

Reach 5R: Post Inflow=6.56 cfs 31,324 cf
Outflow=6.56 cfs 31,324 cf

Total Runoff Area = 3,615,107 sf Runoff Volume = 46,854 cf Average Runoff Depth = 0.16"
99.81% Pervious = 3,608,295 sf 0.19% Impervious = 6,812 sf

Summary for Subcatchment 1S: DA-1

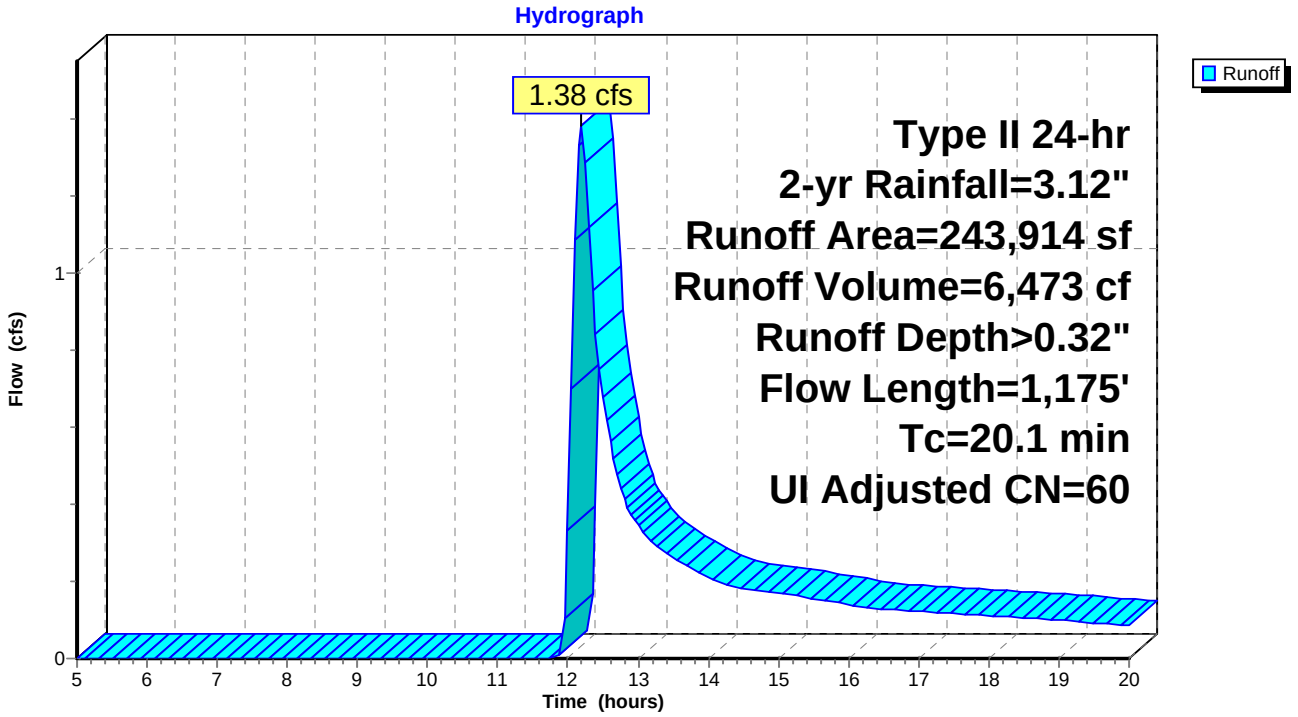
Runoff = 1.38 cfs @ 12.19 hrs, Volume= 6,473 cf, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.12"

	Area (sf)	CN	Adj	Description
	223,296	58		Meadow, non-grazed, HSG B
*	17,212	89		Gravel, HSG A
	3,406	98		Unconnected roofs, HSG A
	243,914	61	60	Weighted Average, UI Adjusted
	240,508			98.60% Pervious Area
	3,406			1.40% Impervious Area
	3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	50	0.0140	7.04	9.84	**Pipe Channel, Culvert** 16.0" Round Area= 1.4 sf Perim= 4.2' r= 0.33' n= 0.012 Concrete pipe, finished
1.6	111	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.1	1,175	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

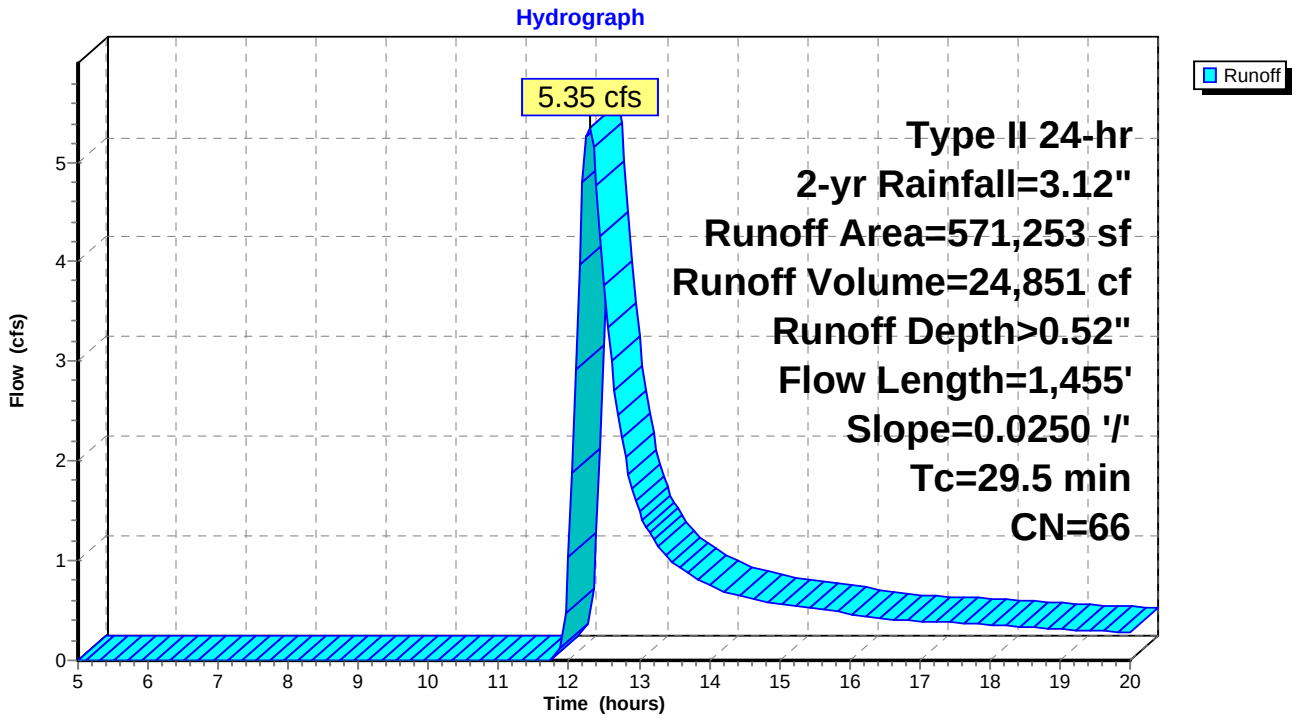
Runoff = 5.35 cfs @ 12.29 hrs, Volume= 24,851 cf, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.12"

	Area (sf)	CN	Description
	422,572	58	Meadow, non-grazed, HSG B
*	148,681	89	Gravel, HSG A
	571,253	66	Weighted Average
	571,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-D

[45] Hint: Runoff=Zero

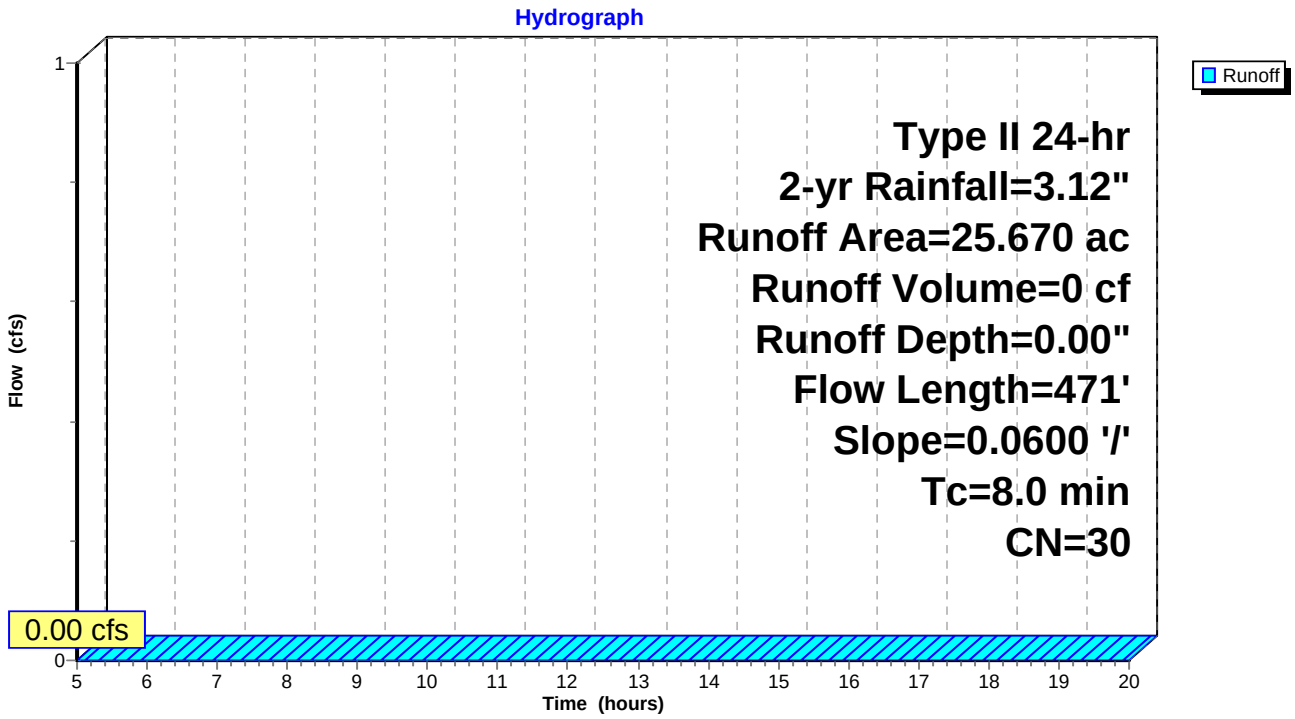
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.12"

Area (ac)	CN	Description
25.670	30	Meadow, non-grazed, HSG A
25.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0600	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
1.6	371	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	471	Total			

Subcatchment 3S: DA-D



Summary for Subcatchment 6S: DA-1

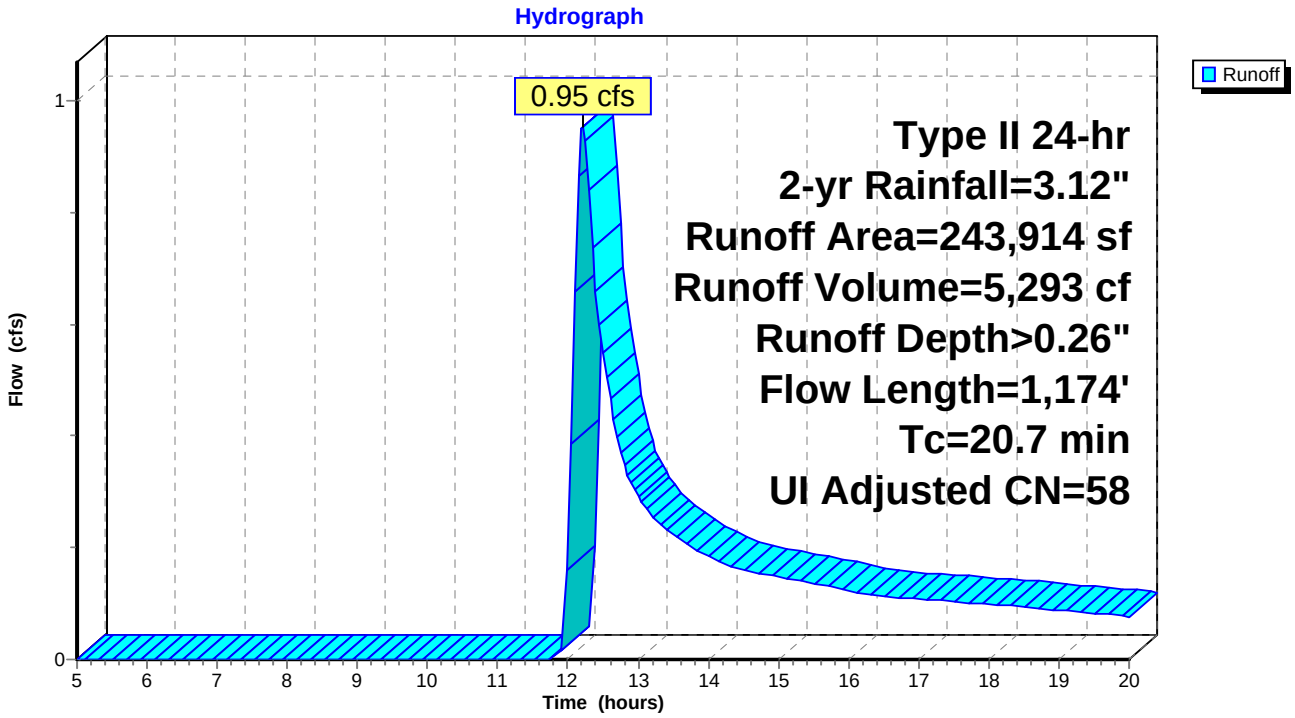
Runoff = 0.95 cfs @ 12.21 hrs, Volume= 5,293 cf, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.12"

Area (sf)	CN	Adj	Description
240,508	58		Meadow, non-grazed, HSG B
3,406	98		Unconnected roofs, HSG A
243,914	59	58	Weighted Average, UI Adjusted
240,508			98.60% Pervious Area
3,406			1.40% Impervious Area
3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	160	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.7	1,174	Total			

Subcatchment 6S: DA-1



Summary for Subcatchment 7S: DA-2

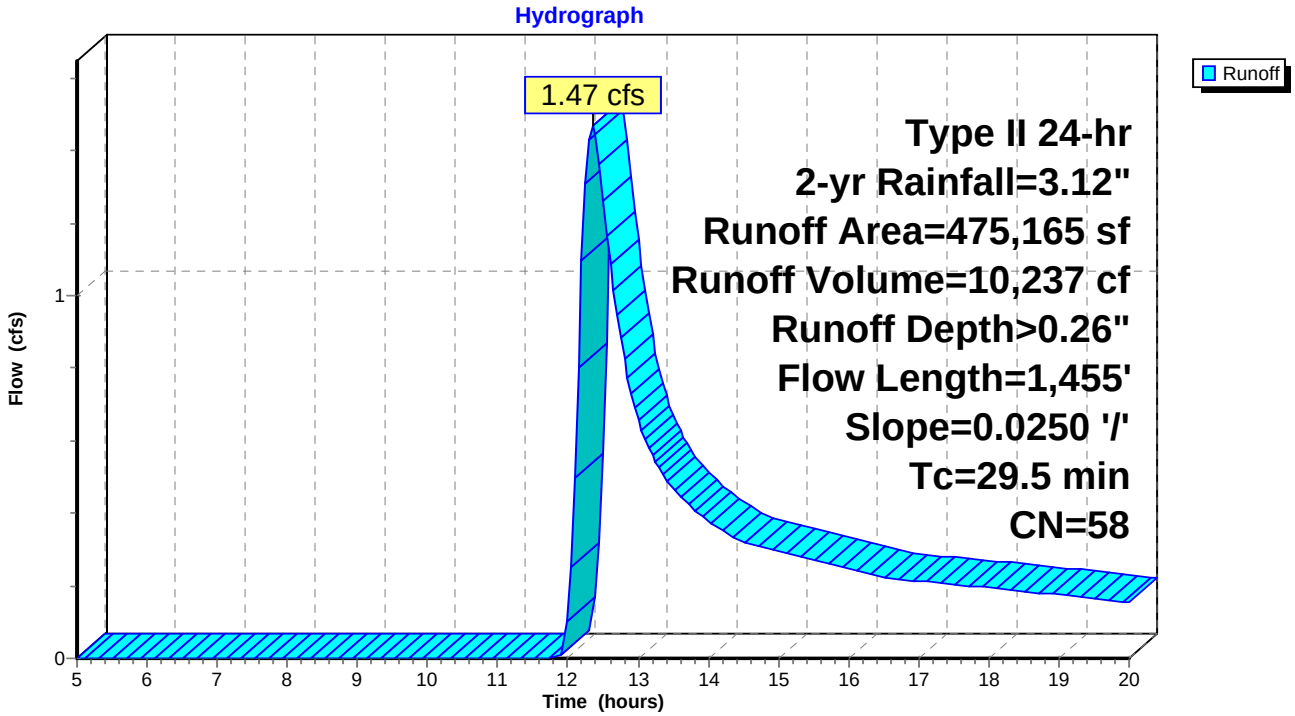
Runoff = 1.47 cfs @ 12.35 hrs, Volume= 10,237 cf, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.12"

Area (sf)	CN	Description
475,165	58	Meadow, non-grazed, HSG B
475,165		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 7S: DA-2



Summary for Subcatchment 8S: DA-D

[45] Hint: Runoff=Zero

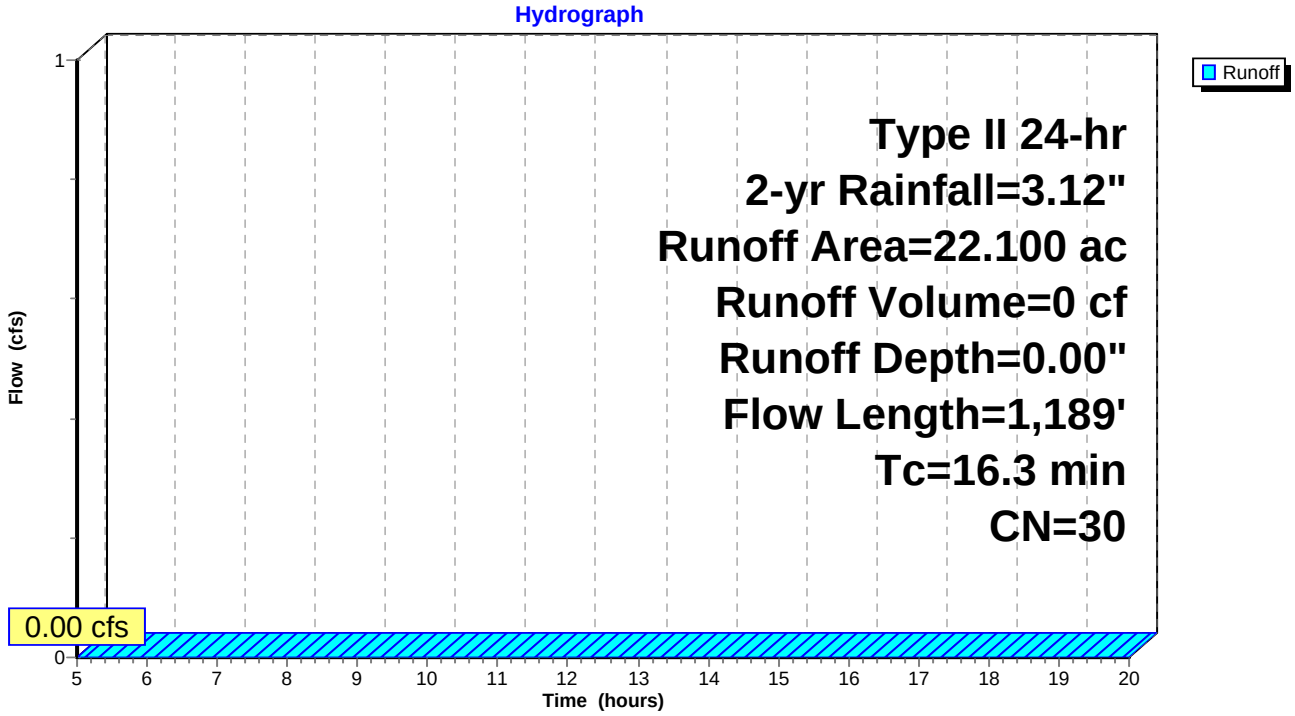
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=3.12"

Area (ac)	CN	Description
22.100	30	Meadow, non-grazed, HSG A
22.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
4.4	425	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	664	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.3	1,189	Total			

Subcatchment 8S: DA-D



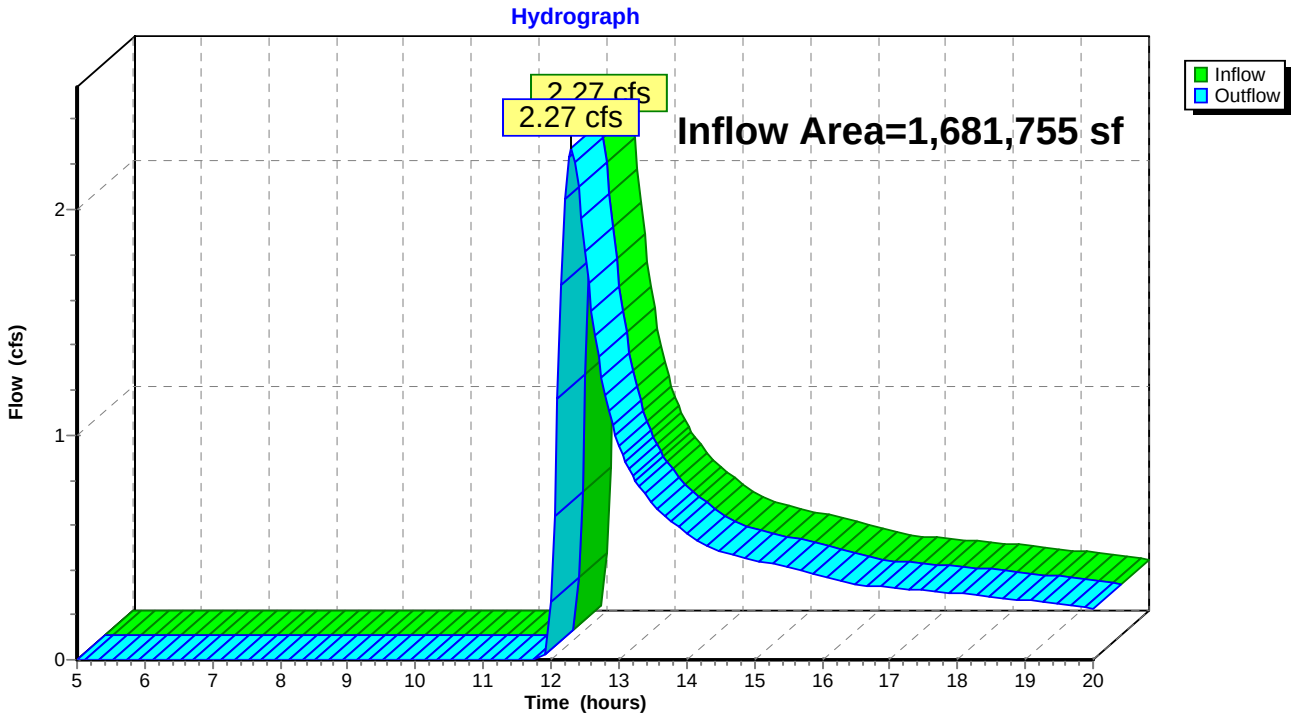
Summary for Reach 2R: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,681,755 sf, 0.20% Impervious, Inflow Depth > 0.11" for 2-yr event
Inflow = 2.27 cfs @ 12.29 hrs, Volume= 15,530 cf
Outflow = 2.27 cfs @ 12.29 hrs, Volume= 15,530 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Pre



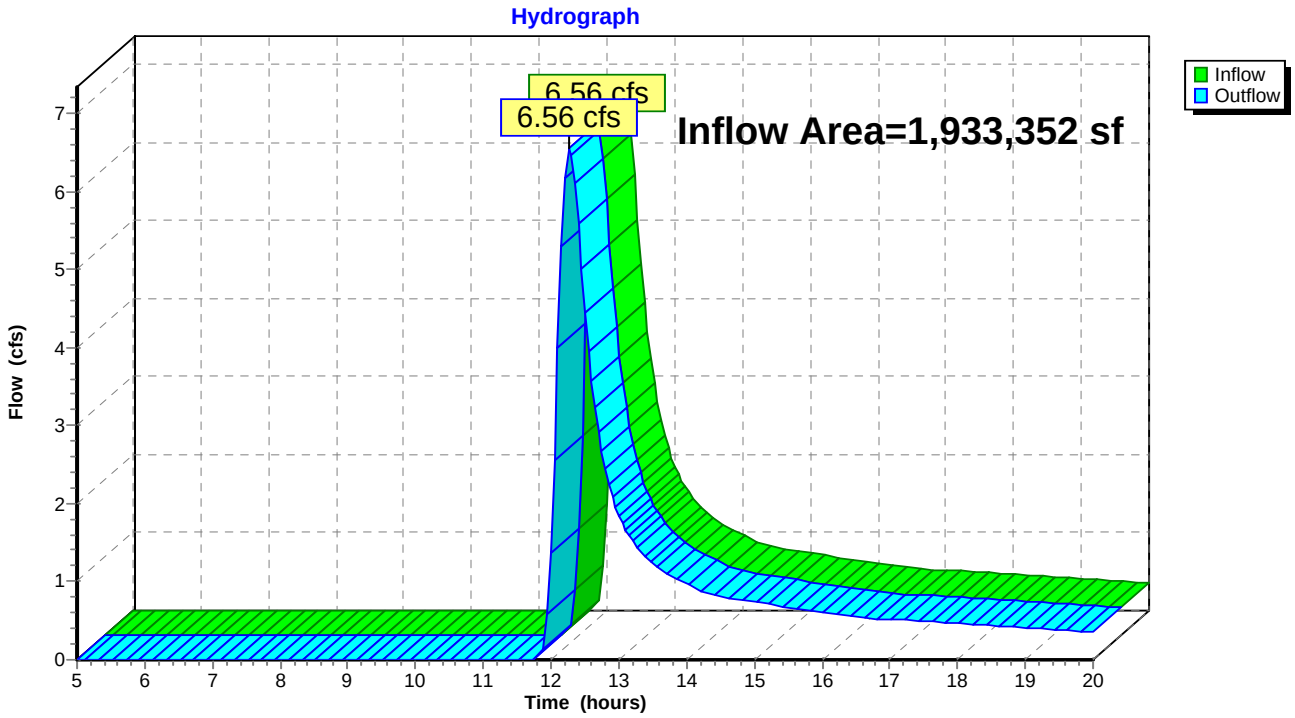
Summary for Reach 5R: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,933,352 sf, 0.18% Impervious, Inflow Depth > 0.19" for 2-yr event
Inflow = 6.56 cfs @ 12.27 hrs, Volume= 31,324 cf
Outflow = 6.56 cfs @ 12.27 hrs, Volume= 31,324 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Post



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>0.91"
Flow Length=1,175' Tc=20.1 min UI Adjusted CN=60 Runoff=5.51 cfs 18,519 cf

Subcatchment 2S: DA-2 Runoff Area=571,253 sf 0.00% Impervious Runoff Depth>1.26"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=66 Runoff=15.01 cfs 60,014 cf

Subcatchment 3S: DA-D Runoff Area=25.670 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=471' Slope=0.0600 '/' Tc=8.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment 6S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>0.80"
Flow Length=1,174' Tc=20.7 min UI Adjusted CN=58 Runoff=4.57 cfs 16,324 cf

Subcatchment 7S: DA-2 Runoff Area=475,165 sf 0.00% Impervious Runoff Depth>0.80"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=58 Runoff=6.95 cfs 31,634 cf

Subcatchment 8S: DA-D Runoff Area=22.100 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,189' Tc=16.3 min CN=30 Runoff=0.00 cfs 0 cf

Reach 2R: Pre Inflow=10.87 cfs 47,958 cf
Outflow=10.87 cfs 47,958 cf

Reach 5R: Post Inflow=19.69 cfs 78,533 cf
Outflow=19.69 cfs 78,533 cf

Total Runoff Area = 3,615,107 sf Runoff Volume = 126,491 cf Average Runoff Depth = 0.42"
99.81% Pervious = 3,608,295 sf 0.19% Impervious = 6,812 sf

Summary for Subcatchment 1S: DA-1

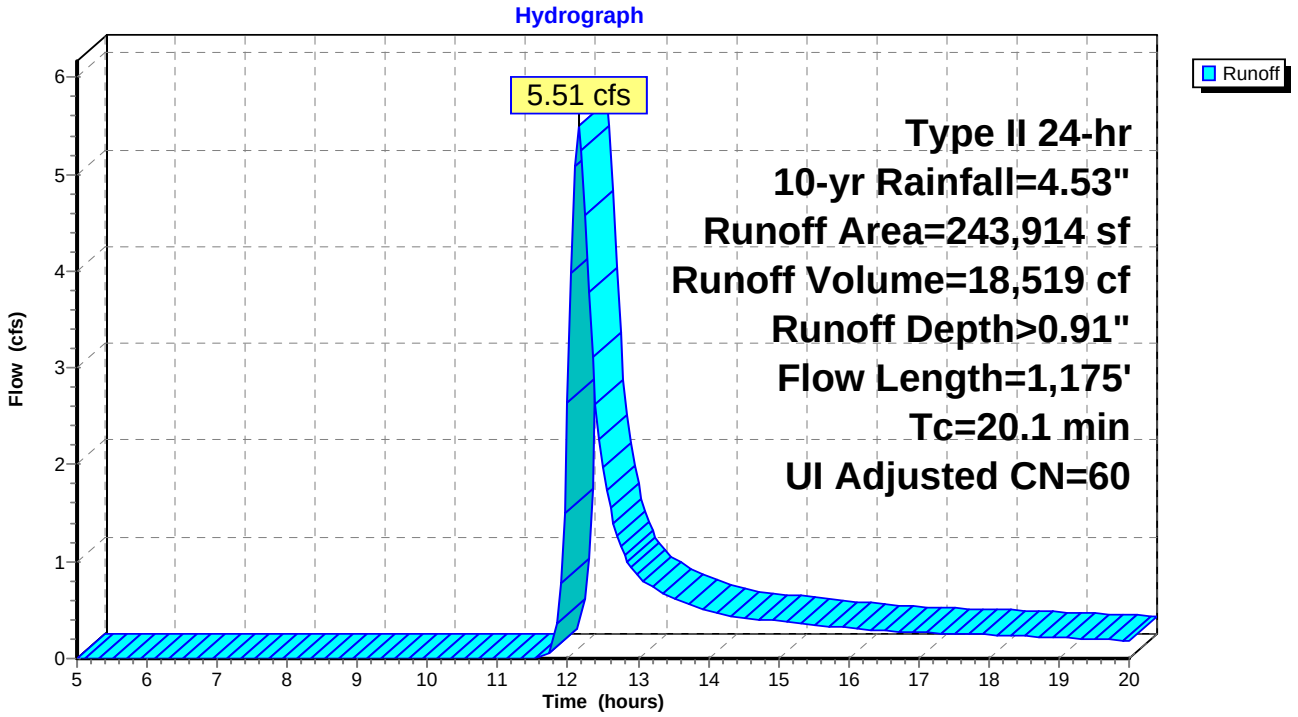
Runoff = 5.51 cfs @ 12.16 hrs, Volume= 18,519 cf, Depth> 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

	Area (sf)	CN	Adj	Description
	223,296	58		Meadow, non-grazed, HSG B
*	17,212	89		Gravel, HSG A
	3,406	98		Unconnected roofs, HSG A
	243,914	61	60	Weighted Average, UI Adjusted
	240,508			98.60% Pervious Area
	3,406			1.40% Impervious Area
	3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	50	0.0140	7.04	9.84	**Pipe Channel, Culvert** 16.0" Round Area= 1.4 sf Perim= 4.2' r= 0.33' n= 0.012 Concrete pipe, finished
1.6	111	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.1	1,175	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

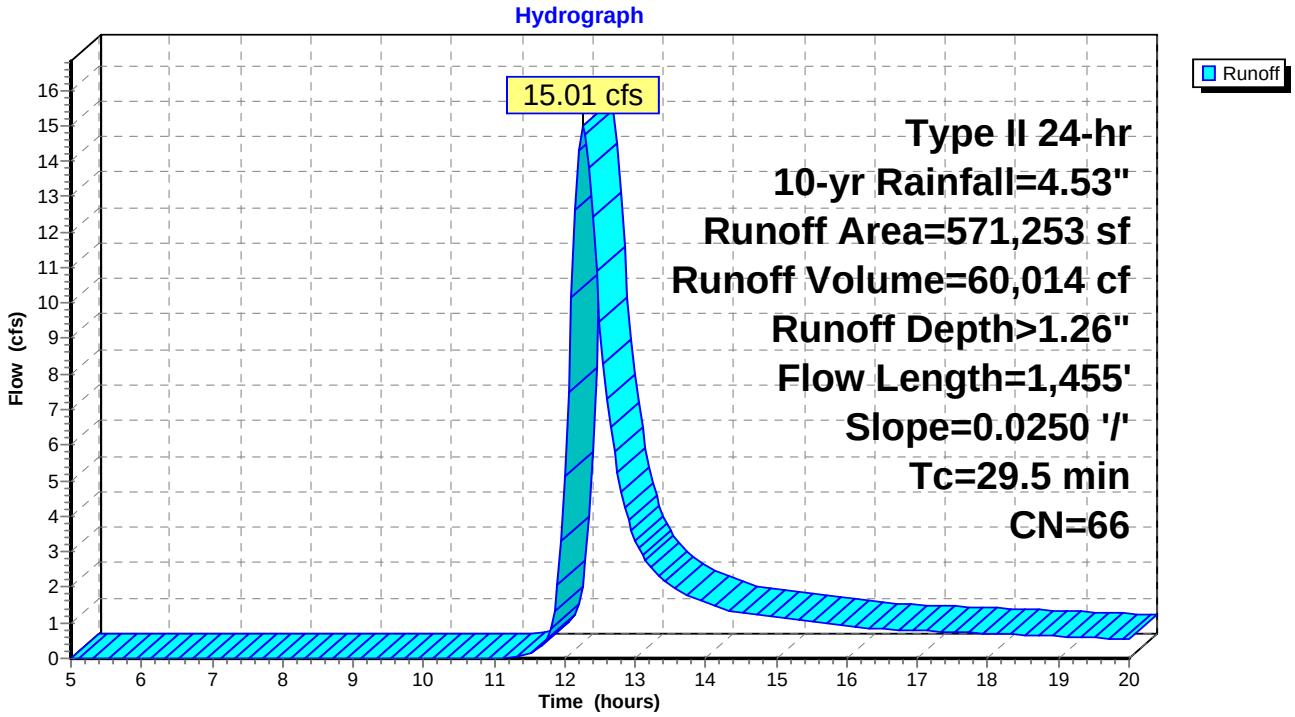
Runoff = 15.01 cfs @ 12.26 hrs, Volume= 60,014 cf, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

	Area (sf)	CN	Description
	422,572	58	Meadow, non-grazed, HSG B
*	148,681	89	Gravel, HSG A
	571,253	66	Weighted Average
	571,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-D

[45] Hint: Runoff=Zero

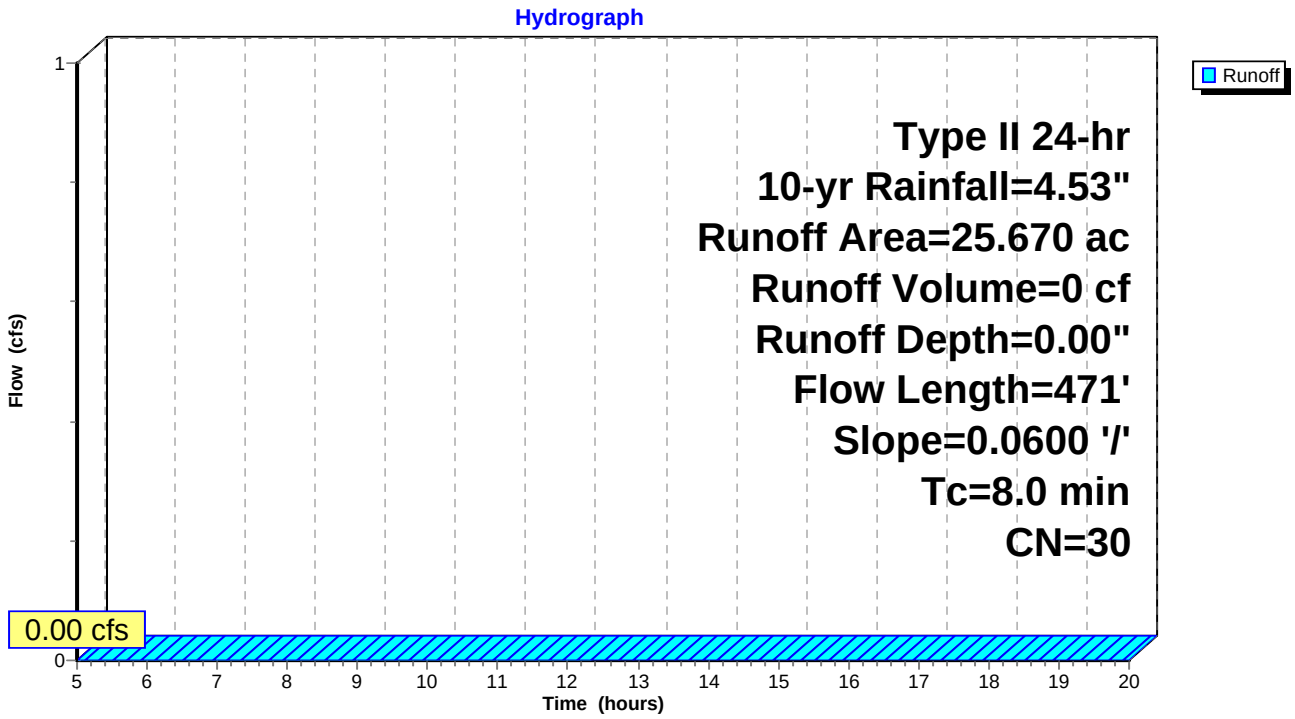
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (ac)	CN	Description
25.670	30	Meadow, non-grazed, HSG A
25.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0600	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
1.6	371	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	471	Total			

Subcatchment 3S: DA-D



Summary for Subcatchment 6S: DA-1

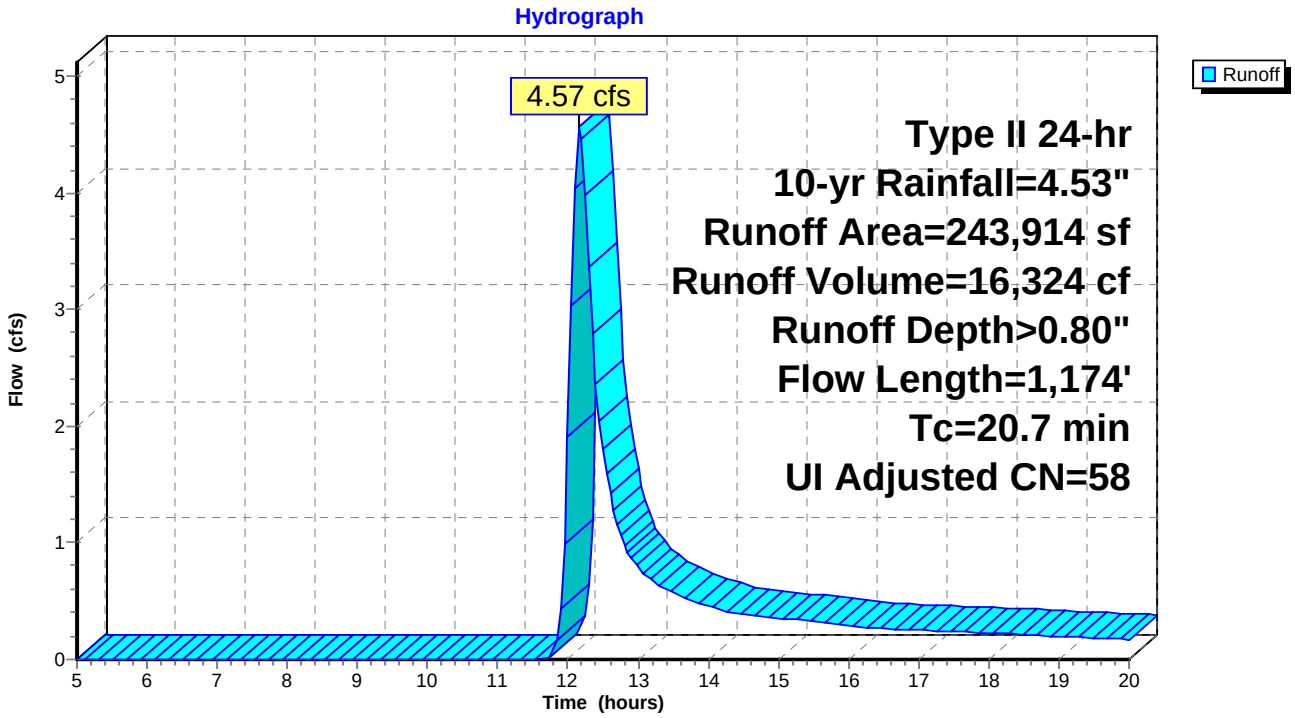
Runoff = 4.57 cfs @ 12.17 hrs, Volume= 16,324 cf, Depth> 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Adj	Description
240,508	58		Meadow, non-grazed, HSG B
3,406	98		Unconnected roofs, HSG A
243,914	59	58	Weighted Average, UI Adjusted
240,508			98.60% Pervious Area
3,406			1.40% Impervious Area
3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	160	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.7	1,174	Total			

Subcatchment 6S: DA-1



Summary for Subcatchment 7S: DA-2

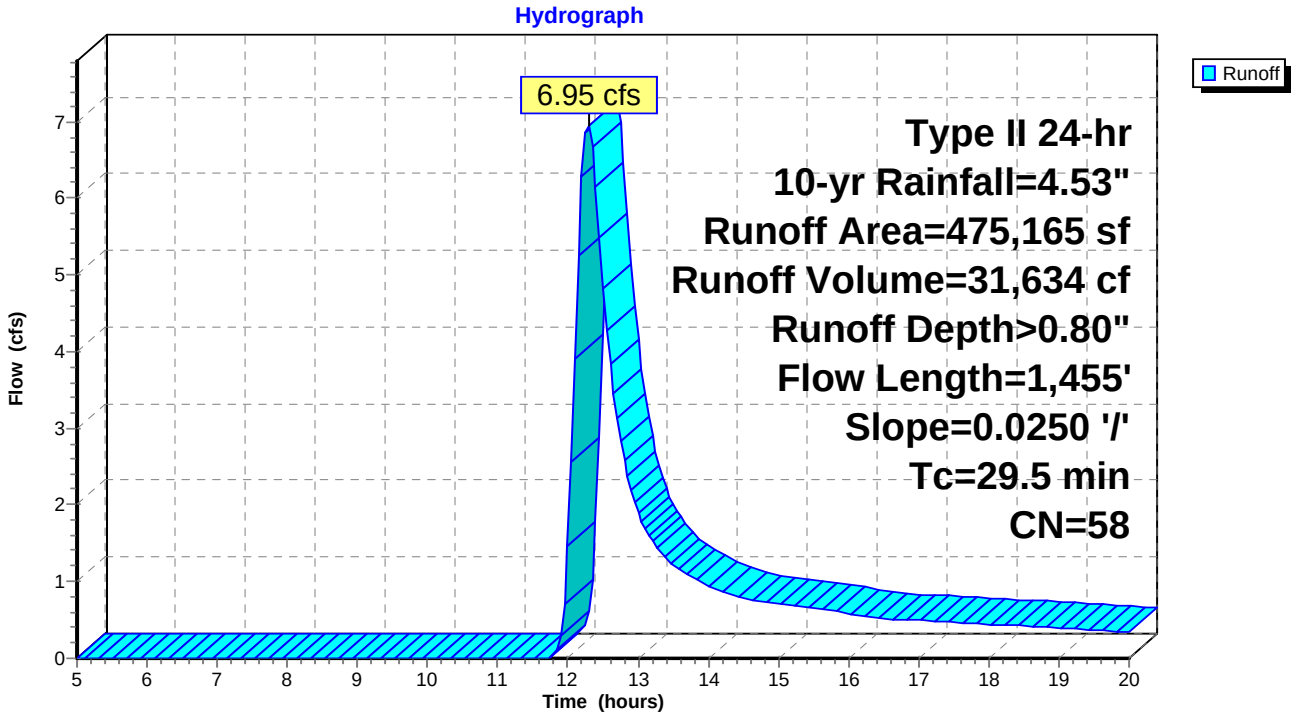
Runoff = 6.95 cfs @ 12.29 hrs, Volume= 31,634 cf, Depth> 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (sf)	CN	Description
475,165	58	Meadow, non-grazed, HSG B
475,165		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 7S: DA-2



Summary for Subcatchment 8S: DA-D

[45] Hint: Runoff=Zero

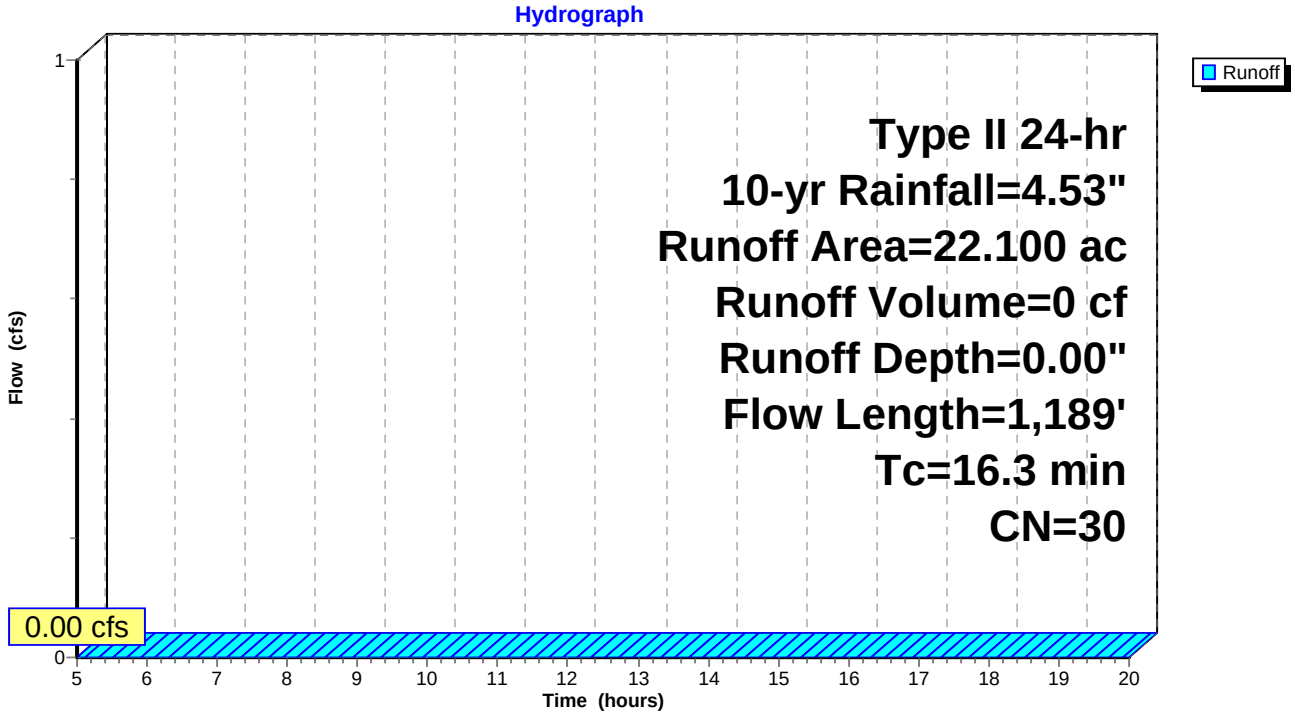
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.53"

Area (ac)	CN	Description
22.100	30	Meadow, non-grazed, HSG A
22.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
4.4	425	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	664	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.3	1,189	Total			

Subcatchment 8S: DA-D



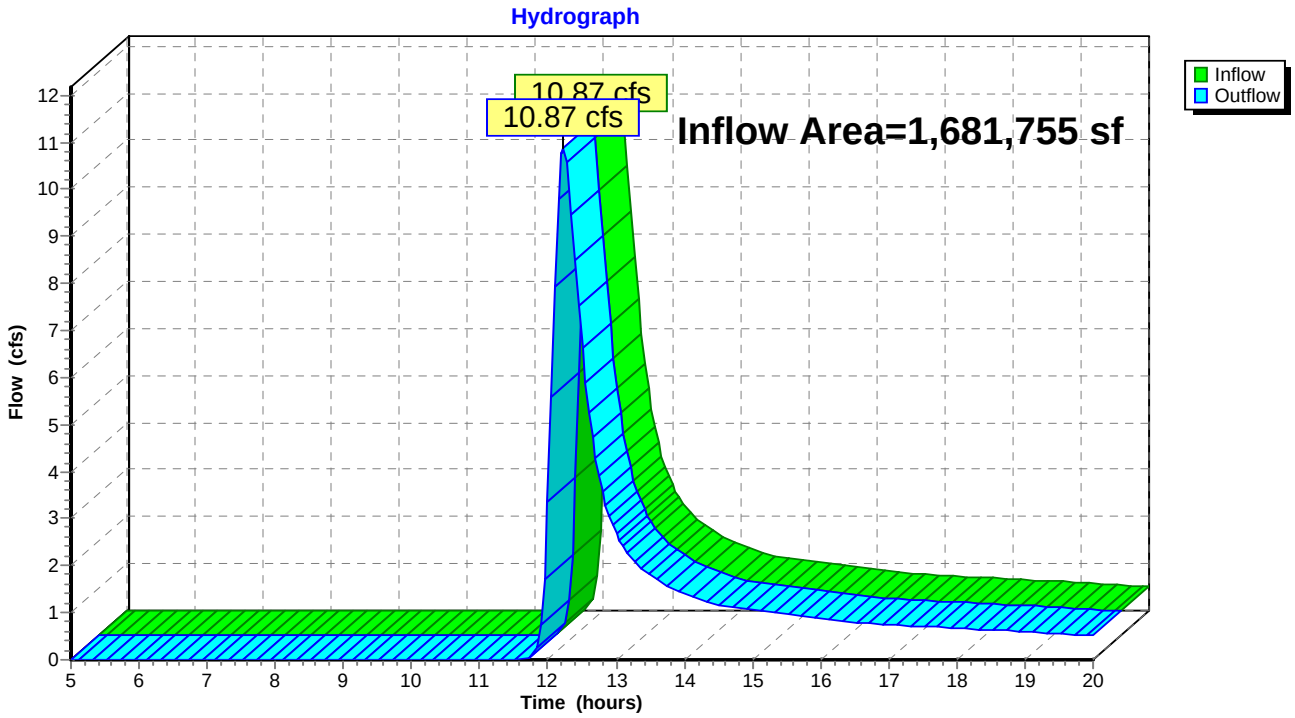
Summary for Reach 2R: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,681,755 sf, 0.20% Impervious, Inflow Depth > 0.34" for 10-yr event
Inflow = 10.87 cfs @ 12.23 hrs, Volume= 47,958 cf
Outflow = 10.87 cfs @ 12.23 hrs, Volume= 47,958 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Pre



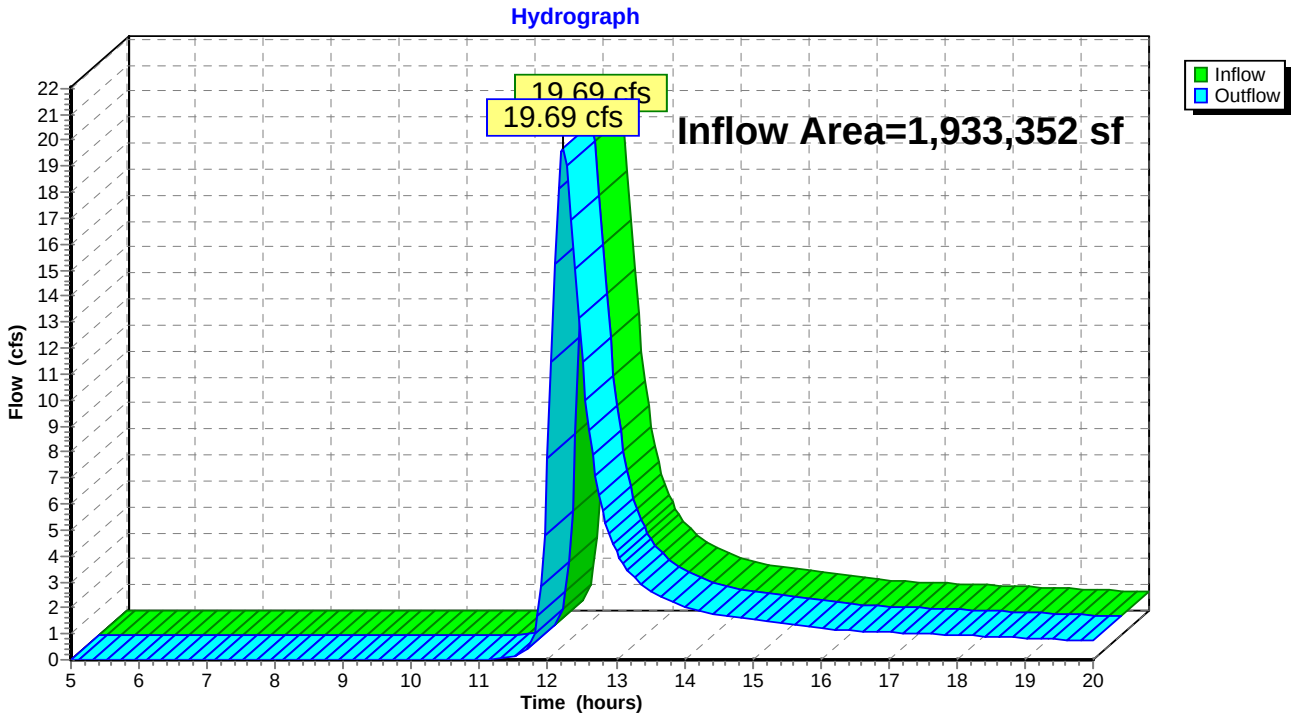
Summary for Reach 5R: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,933,352 sf, 0.18% Impervious, Inflow Depth > 0.49" for 10-yr event
Inflow = 19.69 cfs @ 12.23 hrs, Volume= 78,533 cf
Outflow = 19.69 cfs @ 12.23 hrs, Volume= 78,533 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Post



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>1.46"
Flow Length=1,175' Tc=20.1 min UI Adjusted CN=60 Runoff=9.37 cfs 29,613 cf

Subcatchment 2S: DA-2 Runoff Area=571,253 sf 0.00% Impervious Runoff Depth>1.90"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=66 Runoff=23.33 cfs 90,481 cf

Subcatchment 3S: DA-D Runoff Area=25.670 ac 0.00% Impervious Runoff Depth>0.02"
Flow Length=471' Slope=0.0600 '/' Tc=8.0 min CN=30 Runoff=0.10 cfs 1,447 cf

Subcatchment 6S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>1.32"
Flow Length=1,174' Tc=20.7 min UI Adjusted CN=58 Runoff=8.15 cfs 26,737 cf

Subcatchment 7S: DA-2 Runoff Area=475,165 sf 0.00% Impervious Runoff Depth>1.31"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=58 Runoff=12.51 cfs 51,845 cf

Subcatchment 8S: DA-D Runoff Area=22.100 ac 0.00% Impervious Runoff Depth>0.02"
Flow Length=1,189' Tc=16.3 min CN=30 Runoff=0.09 cfs 1,207 cf

Reach 2R: Pre Inflow=19.63 cfs 79,789 cf
Outflow=19.63 cfs 79,789 cf

Reach 5R: Post Inflow=31.39 cfs 121,541 cf
Outflow=31.39 cfs 121,541 cf

Total Runoff Area = 3,615,107 sf Runoff Volume = 201,330 cf Average Runoff Depth = 0.67"
99.81% Pervious = 3,608,295 sf 0.19% Impervious = 6,812 sf

Summary for Subcatchment 1S: DA-1

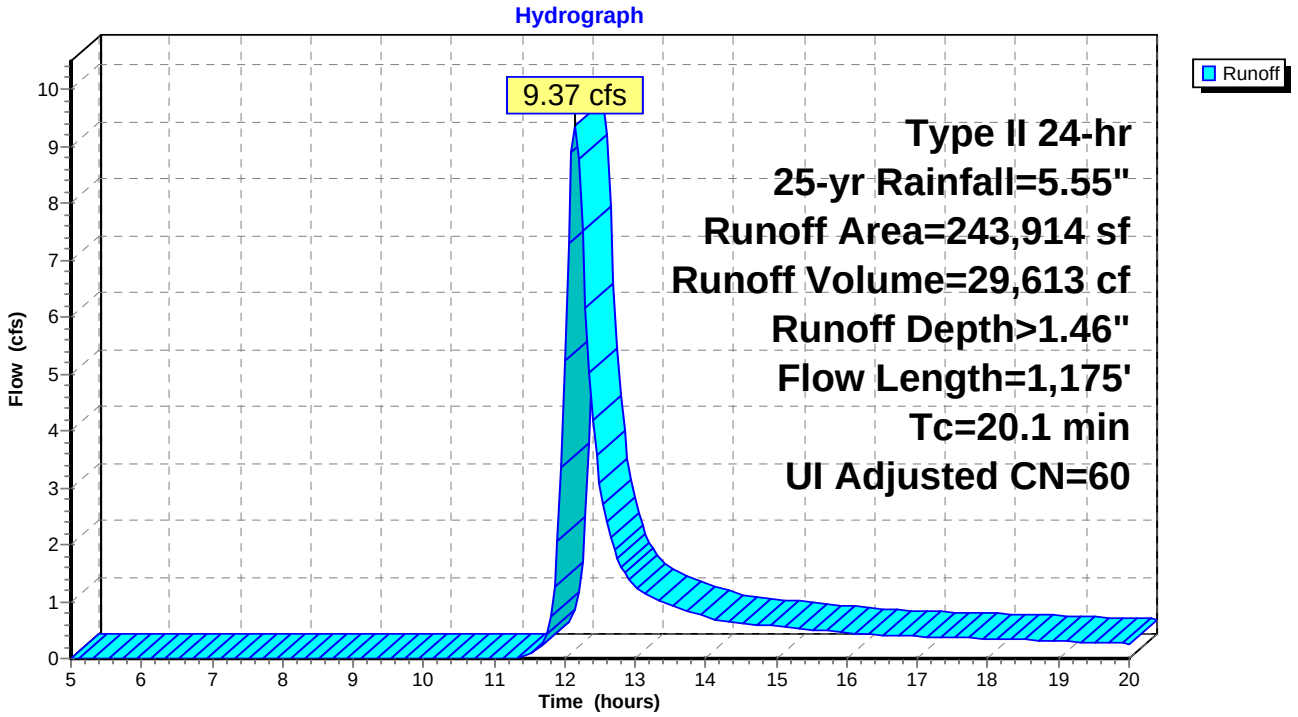
Runoff = 9.37 cfs @ 12.15 hrs, Volume= 29,613 cf, Depth> 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.55"

	Area (sf)	CN	Adj	Description
	223,296	58		Meadow, non-grazed, HSG B
*	17,212	89		Gravel, HSG A
	3,406	98		Unconnected roofs, HSG A
	243,914	61	60	Weighted Average, UI Adjusted
	240,508			98.60% Pervious Area
	3,406			1.40% Impervious Area
	3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	50	0.0140	7.04	9.84	**Pipe Channel, Culvert** 16.0" Round Area= 1.4 sf Perim= 4.2' r= 0.33' n= 0.012 Concrete pipe, finished
1.6	111	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.1	1,175	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

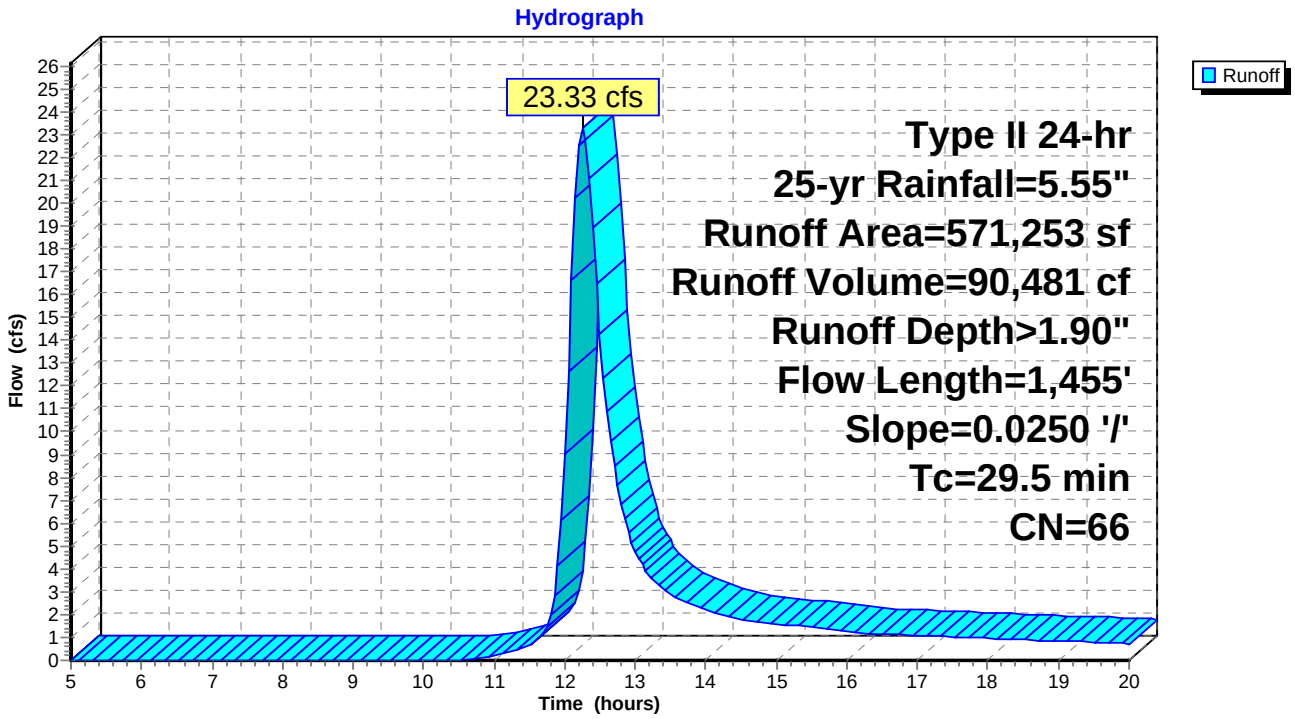
Runoff = 23.33 cfs @ 12.25 hrs, Volume= 90,481 cf, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.55"

	Area (sf)	CN	Description
	422,572	58	Meadow, non-grazed, HSG B
*	148,681	89	Gravel, HSG A
	571,253	66	Weighted Average
	571,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-D

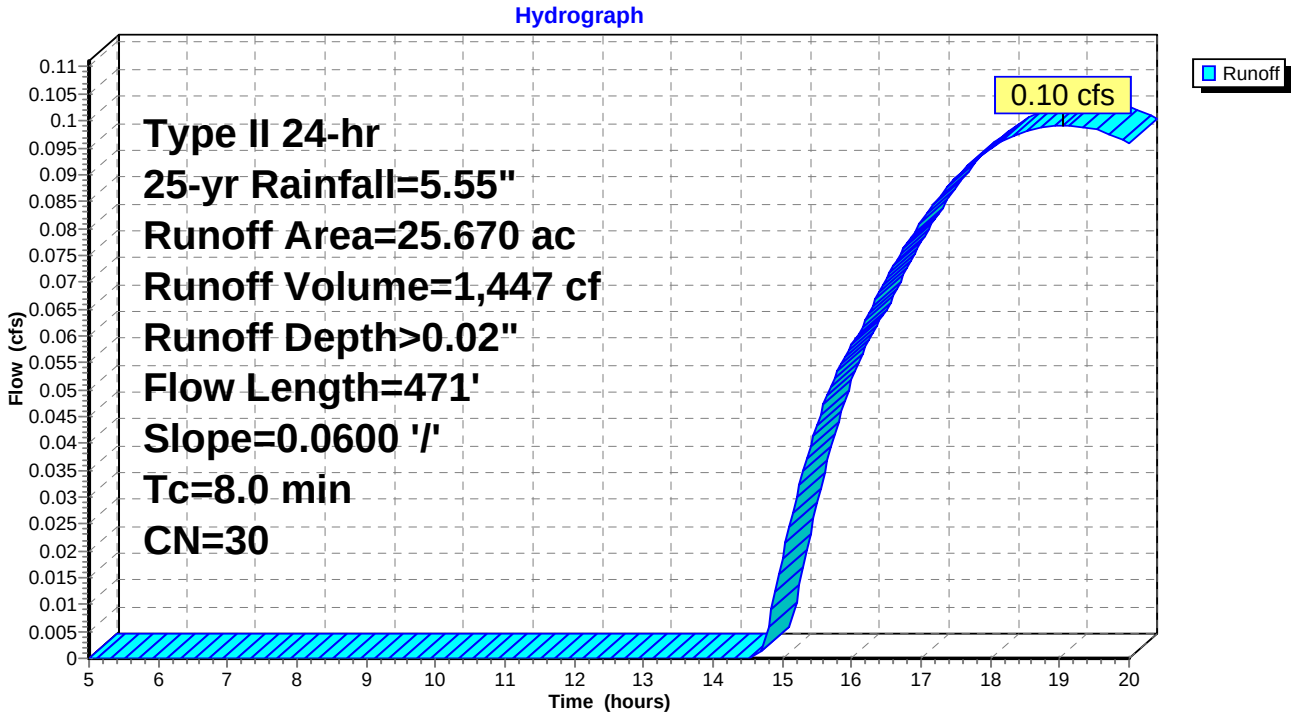
Runoff = 0.10 cfs @ 19.04 hrs, Volume= 1,447 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.55"

Area (ac)	CN	Description
25.670	30	Meadow, non-grazed, HSG A
25.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0600	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
1.6	371	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	471	Total			

Subcatchment 3S: DA-D



Summary for Subcatchment 6S: DA-1

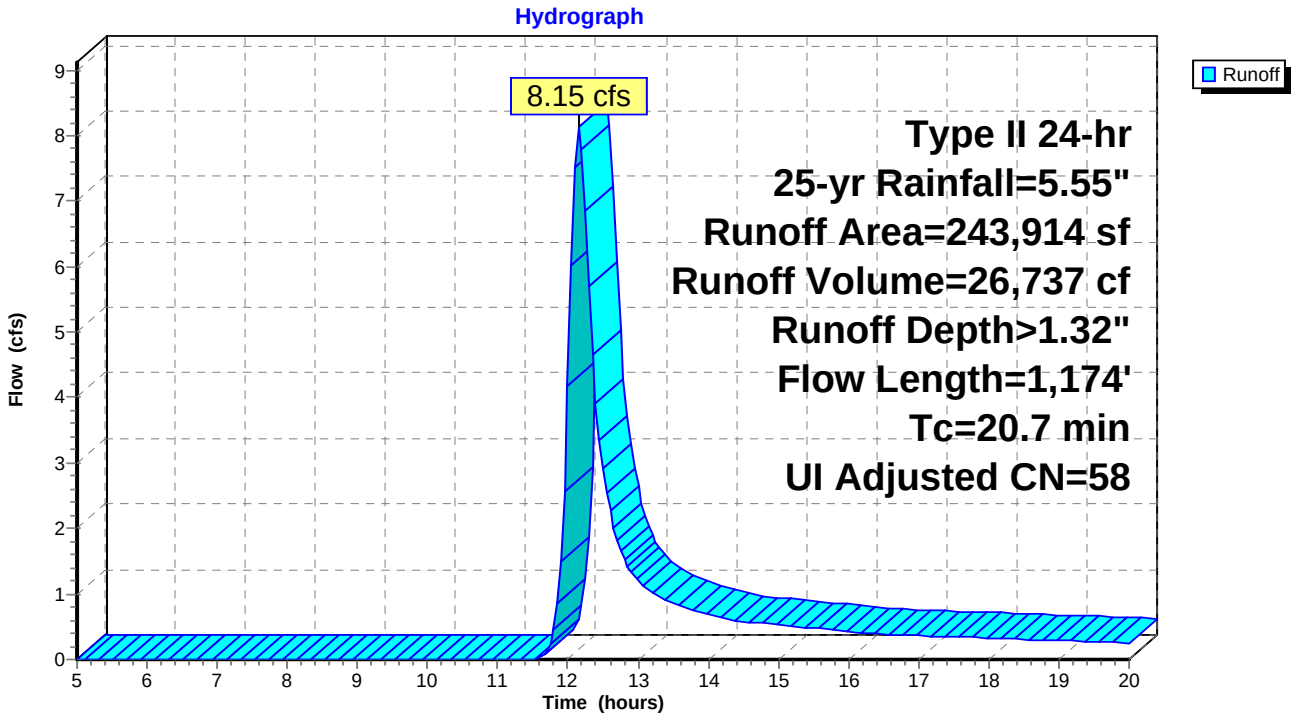
Runoff = 8.15 cfs @ 12.16 hrs, Volume= 26,737 cf, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.55"

Area (sf)	CN	Adj	Description
240,508	58		Meadow, non-grazed, HSG B
3,406	98		Unconnected roofs, HSG A
243,914	59	58	Weighted Average, UI Adjusted
240,508			98.60% Pervious Area
3,406			1.40% Impervious Area
3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	160	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.7	1,174	Total			

Subcatchment 6S: DA-1



Summary for Subcatchment 7S: DA-2

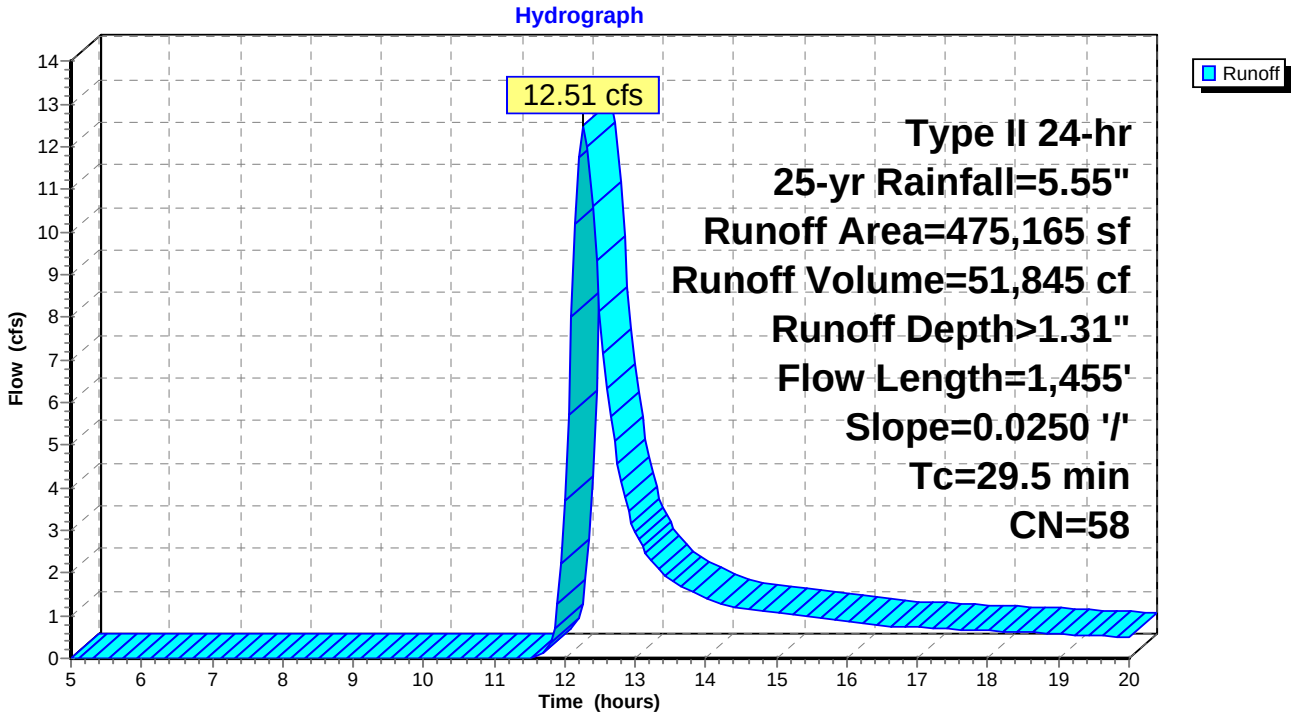
Runoff = 12.51 cfs @ 12.27 hrs, Volume= 51,845 cf, Depth> 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.55"

Area (sf)	CN	Description
475,165	58	Meadow, non-grazed, HSG B
475,165		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 7S: DA-2



Summary for Subcatchment 8S: DA-D

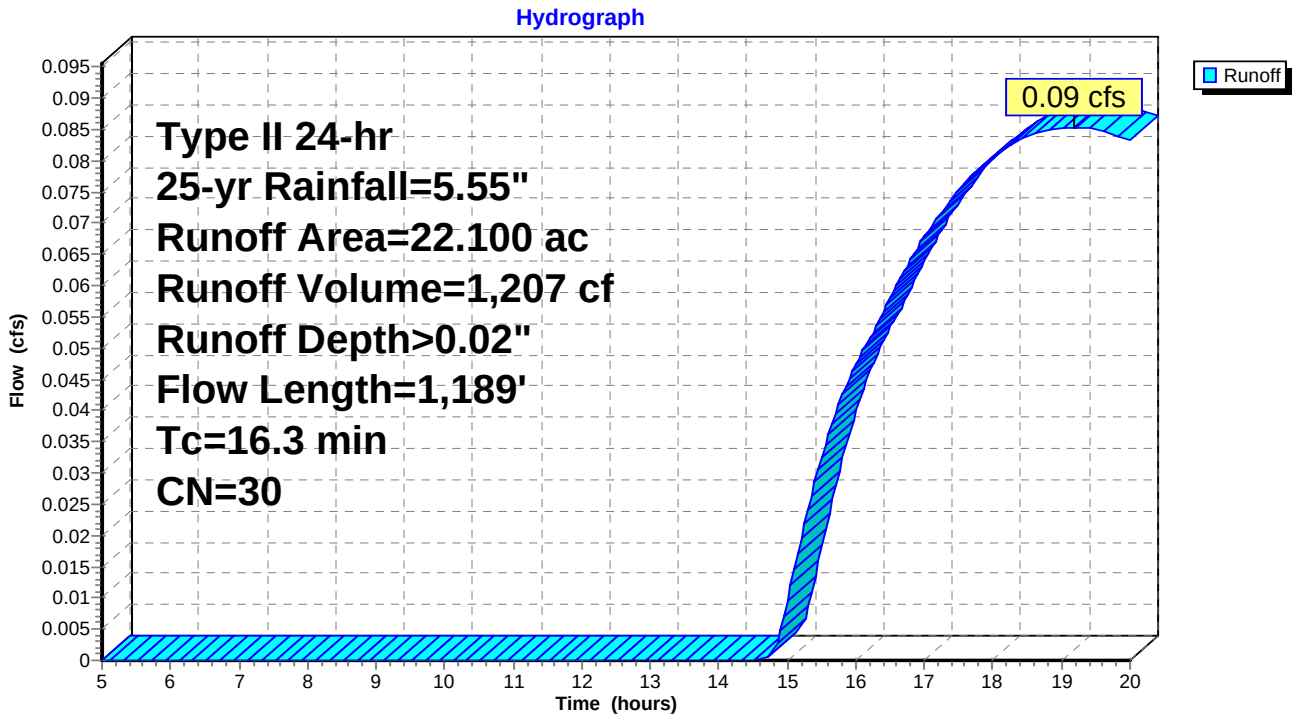
Runoff = 0.09 cfs @ 19.19 hrs, Volume= 1,207 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.55"

Area (ac)	CN	Description
22.100	30	Meadow, non-grazed, HSG A
22.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
4.4	425	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	664	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.3	1,189	Total			

Subcatchment 8S: DA-D



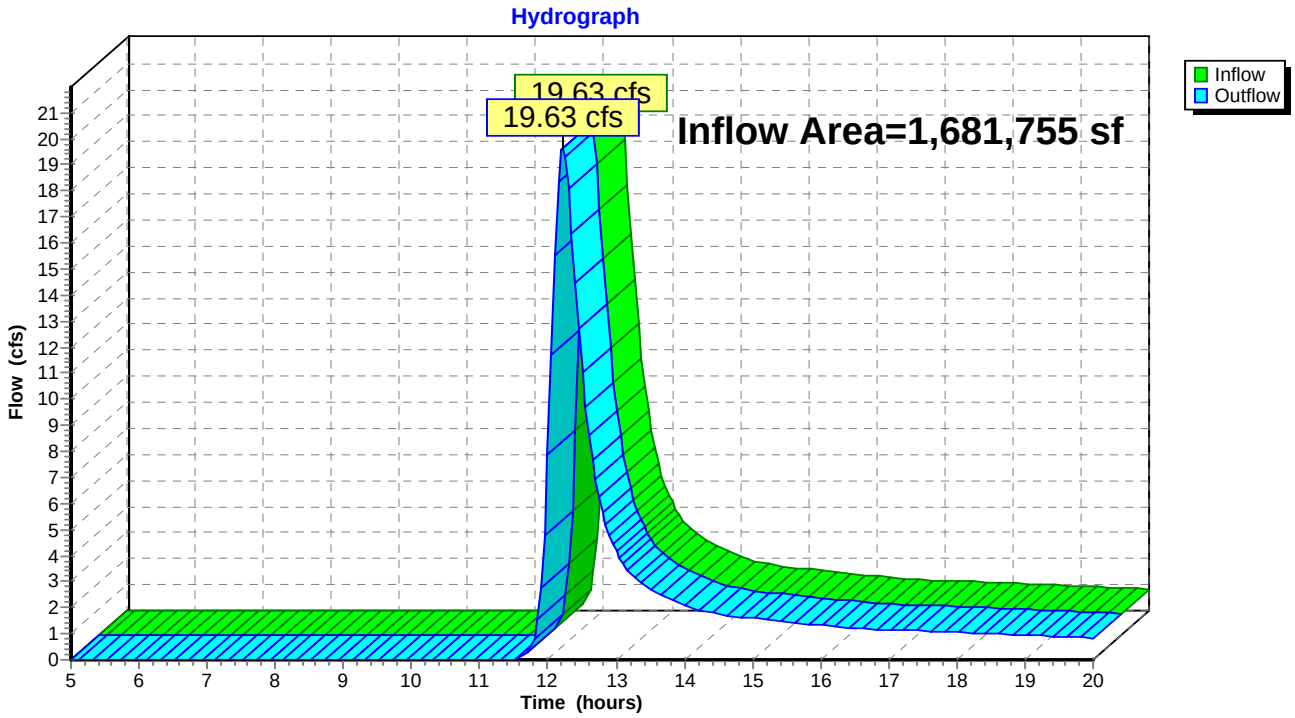
Summary for Reach 2R: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,681,755 sf, 0.20% Impervious, Inflow Depth > 0.57" for 25-yr event
Inflow = 19.63 cfs @ 12.22 hrs, Volume= 79,789 cf
Outflow = 19.63 cfs @ 12.22 hrs, Volume= 79,789 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Pre



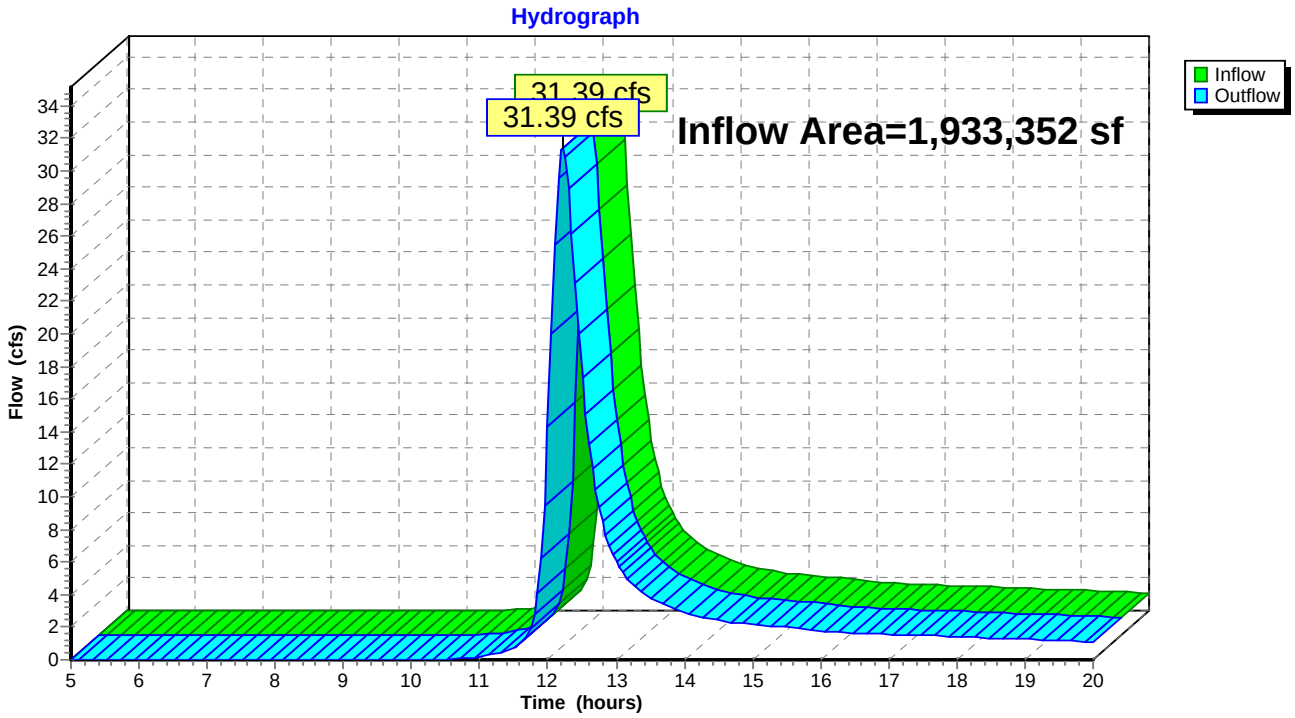
Summary for Reach 5R: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,933,352 sf, 0.18% Impervious, Inflow Depth > 0.75" for 25-yr event
Inflow = 31.39 cfs @ 12.21 hrs, Volume= 121,541 cf
Outflow = 31.39 cfs @ 12.21 hrs, Volume= 121,541 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Post



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>2.02"
Flow Length=1,175' Tc=20.1 min UI Adjusted CN=60 Runoff=13.28 cfs 40,986 cf

Subcatchment 2S: DA-2 Runoff Area=571,253 sf 0.00% Impervious Runoff Depth>2.54"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=66 Runoff=31.51 cfs 120,798 cf

Subcatchment 3S: DA-D Runoff Area=25.670 ac 0.00% Impervious Runoff Depth>0.09"
Flow Length=471' Slope=0.0600 '/' Tc=8.0 min CN=30 Runoff=0.35 cfs 8,376 cf

Subcatchment 6S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>1.85"
Flow Length=1,174' Tc=20.7 min UI Adjusted CN=58 Runoff=11.83 cfs 37,536 cf

Subcatchment 7S: DA-2 Runoff Area=475,165 sf 0.00% Impervious Runoff Depth>1.84"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=58 Runoff=18.28 cfs 72,812 cf

Subcatchment 8S: DA-D Runoff Area=22.100 ac 0.00% Impervious Runoff Depth>0.09"
Flow Length=1,189' Tc=16.3 min CN=30 Runoff=0.30 cfs 7,107 cf

Reach 2R: Pre Inflow=28.69 cfs 117,454 cf
Outflow=28.69 cfs 117,454 cf

Reach 5R: Post Inflow=42.98 cfs 170,160 cf
Outflow=42.98 cfs 170,160 cf

Total Runoff Area = 3,615,107 sf Runoff Volume = 287,615 cf Average Runoff Depth = 0.95"
99.81% Pervious = 3,608,295 sf 0.19% Impervious = 6,812 sf

Summary for Subcatchment 1S: DA-1

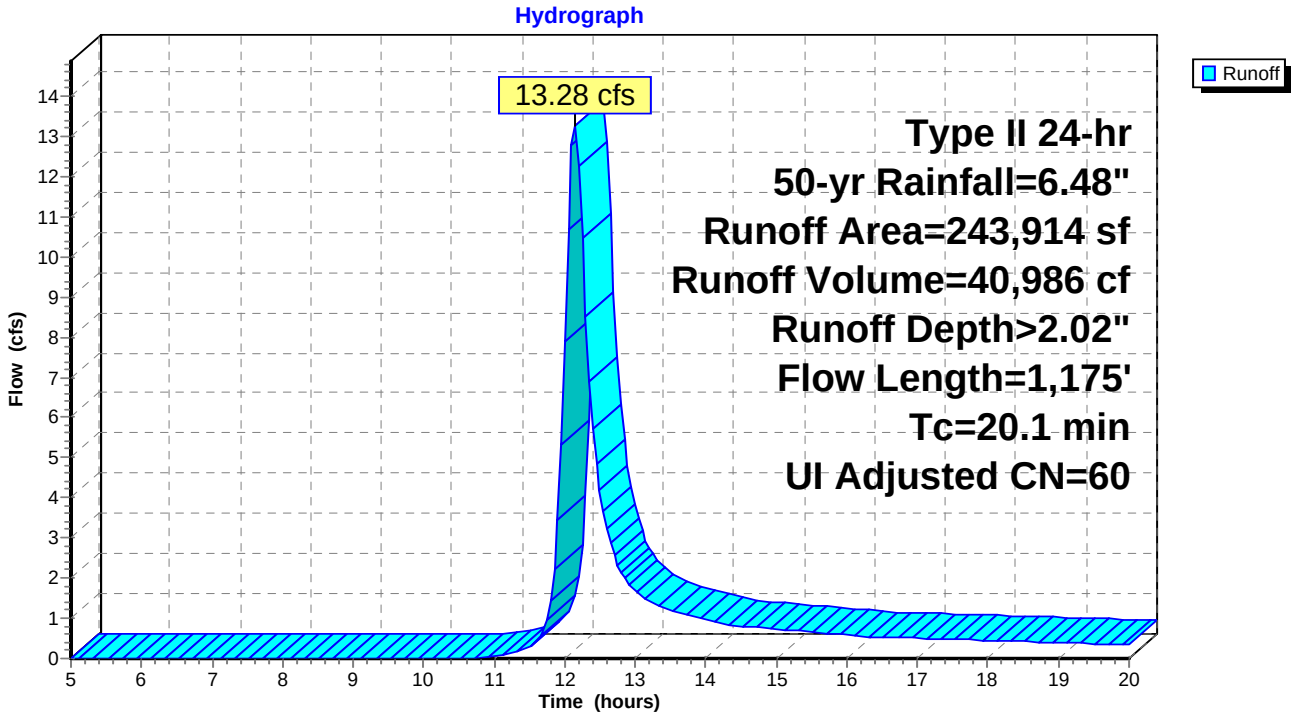
Runoff = 13.28 cfs @ 12.14 hrs, Volume= 40,986 cf, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.48"

	Area (sf)	CN	Adj	Description
	223,296	58		Meadow, non-grazed, HSG B
*	17,212	89		Gravel, HSG A
	3,406	98		Unconnected roofs, HSG A
	243,914	61	60	Weighted Average, UI Adjusted
	240,508			98.60% Pervious Area
	3,406			1.40% Impervious Area
	3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	50	0.0140	7.04	9.84	**Pipe Channel, Culvert** 16.0" Round Area= 1.4 sf Perim= 4.2' r= 0.33' n= 0.012 Concrete pipe, finished
1.6	111	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.1	1,175	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

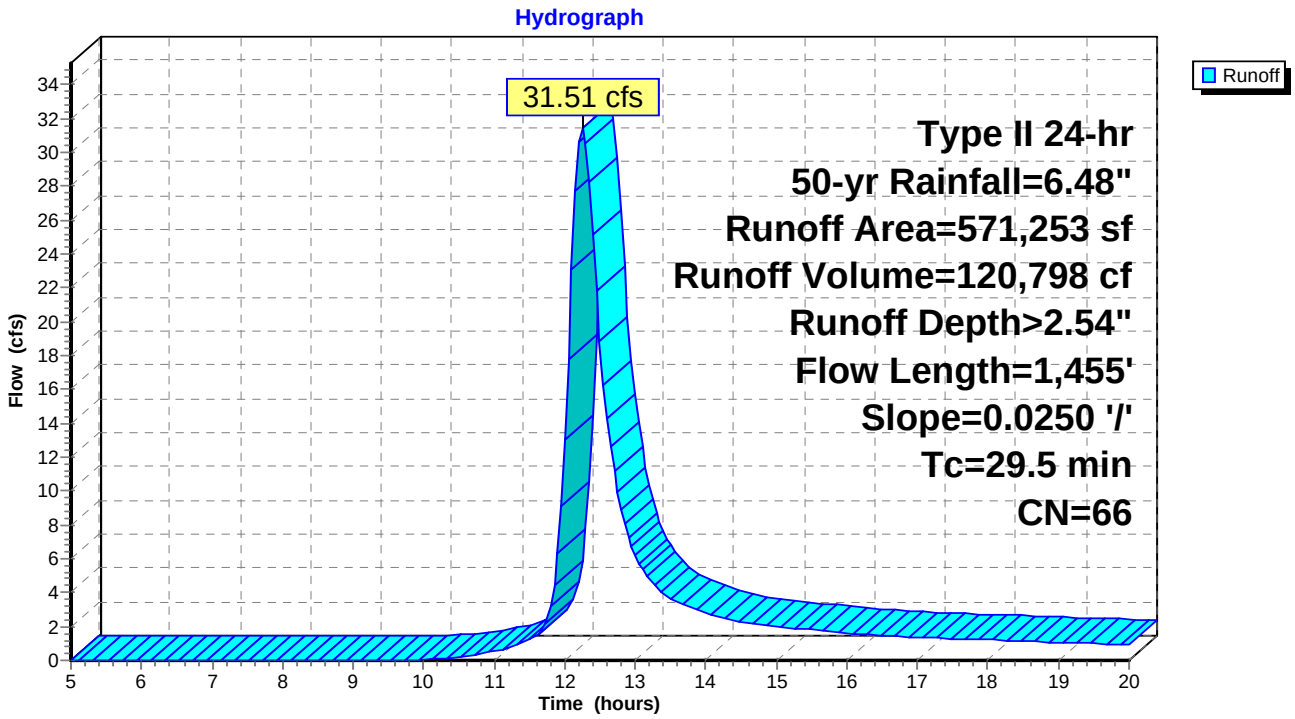
Runoff = 31.51 cfs @ 12.25 hrs, Volume= 120,798 cf, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.48"

	Area (sf)	CN	Description
	422,572	58	Meadow, non-grazed, HSG B
*	148,681	89	Gravel, HSG A
	571,253	66	Weighted Average
	571,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-D

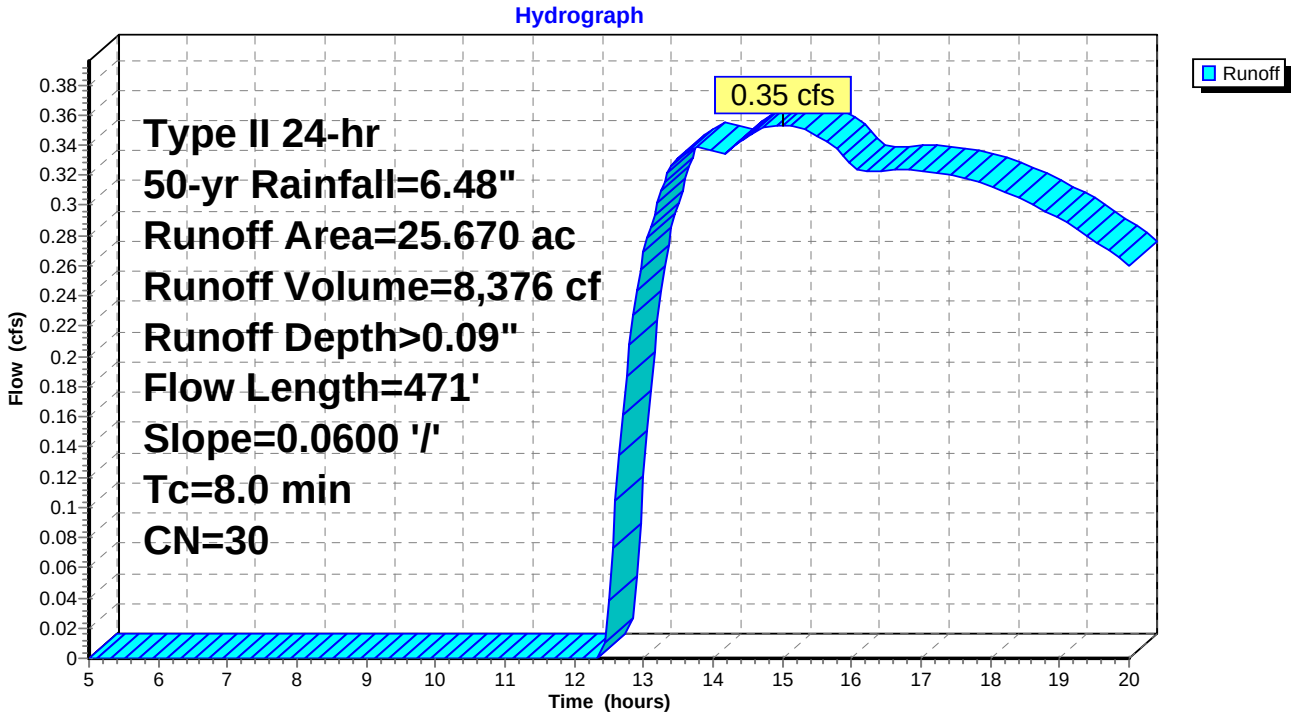
Runoff = 0.35 cfs @ 15.00 hrs, Volume= 8,376 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.48"

Area (ac)	CN	Description
25.670	30	Meadow, non-grazed, HSG A
25.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0600	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
1.6	371	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	471	Total			

Subcatchment 3S: DA-D



Summary for Subcatchment 6S: DA-1

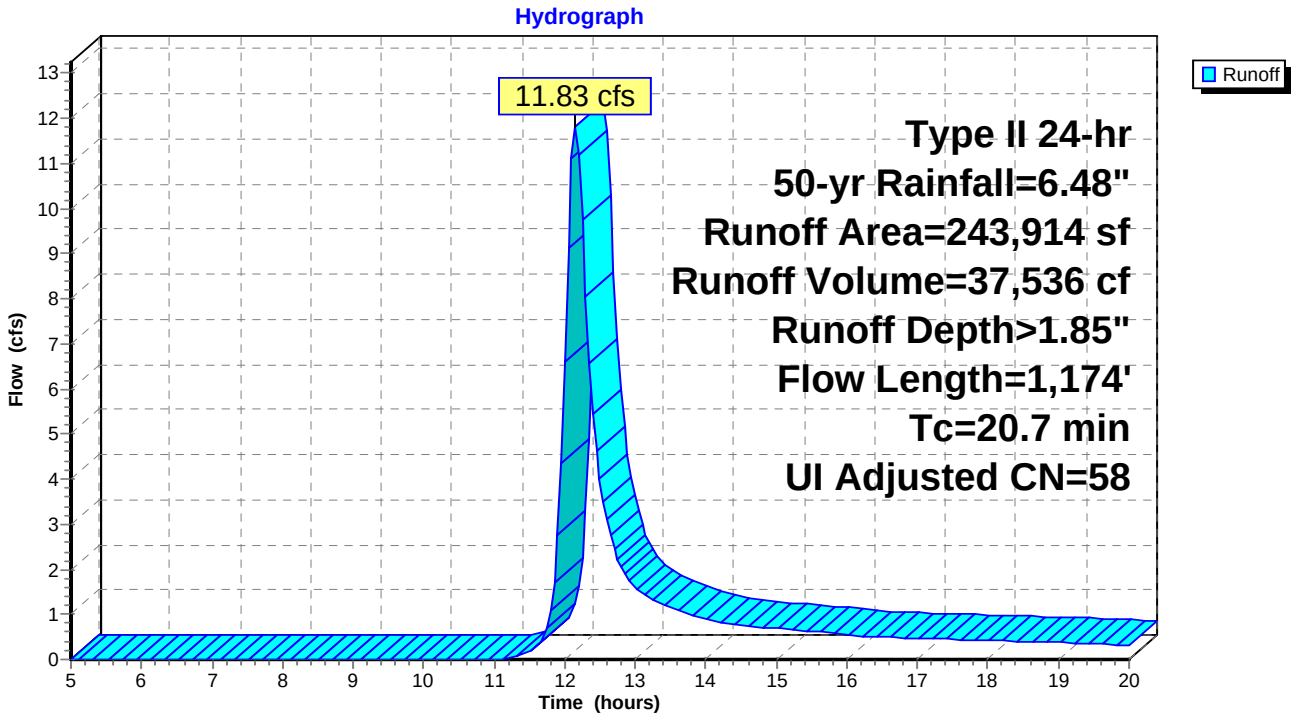
Runoff = 11.83 cfs @ 12.15 hrs, Volume= 37,536 cf, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.48"

Area (sf)	CN	Adj	Description
240,508	58		Meadow, non-grazed, HSG B
3,406	98		Unconnected roofs, HSG A
243,914	59	58	Weighted Average, UI Adjusted
240,508			98.60% Pervious Area
3,406			1.40% Impervious Area
3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	160	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.7	1,174	Total			

Subcatchment 6S: DA-1



Summary for Subcatchment 7S: DA-2

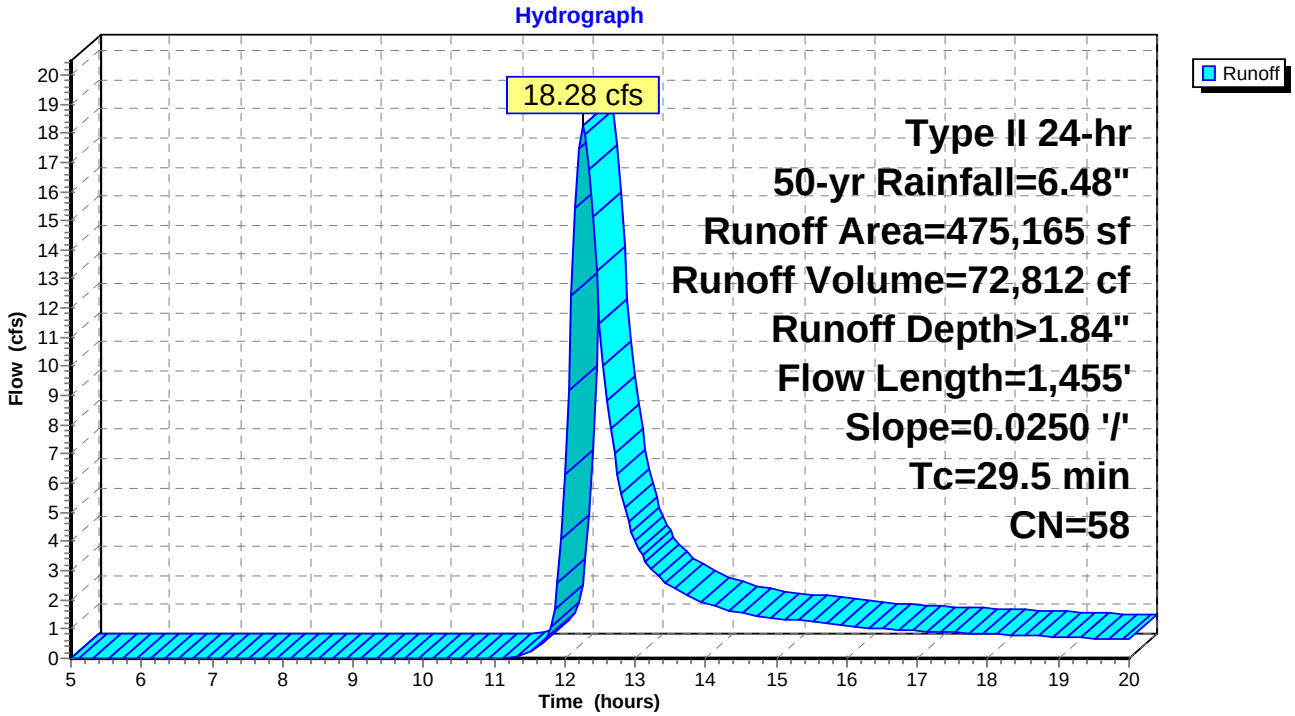
Runoff = 18.28 cfs @ 12.26 hrs, Volume= 72,812 cf, Depth> 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.48"

Area (sf)	CN	Description
475,165	58	Meadow, non-grazed, HSG B
475,165		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 7S: DA-2



Summary for Subcatchment 8S: DA-D

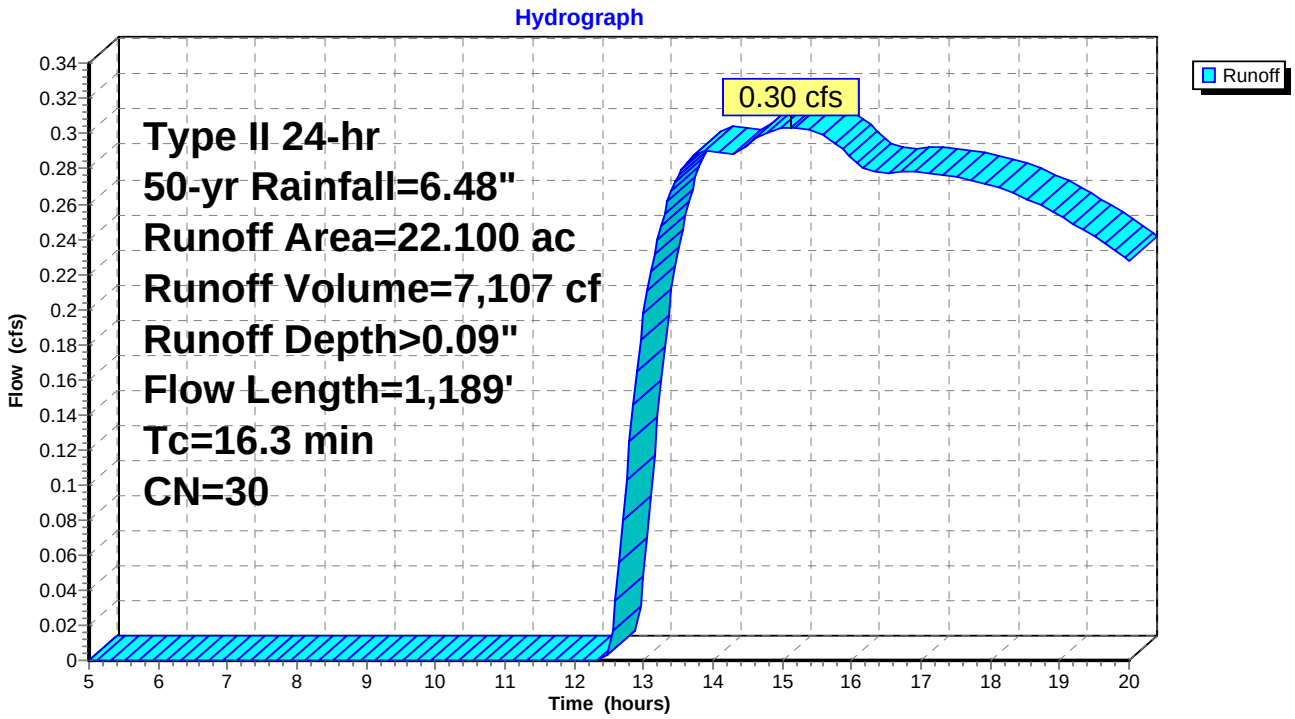
Runoff = 0.30 cfs @ 15.12 hrs, Volume= 7,107 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.48"

Area (ac)	CN	Description
22.100	30	Meadow, non-grazed, HSG A
22.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
4.4	425	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	664	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.3	1,189	Total			

Subcatchment 8S: DA-D



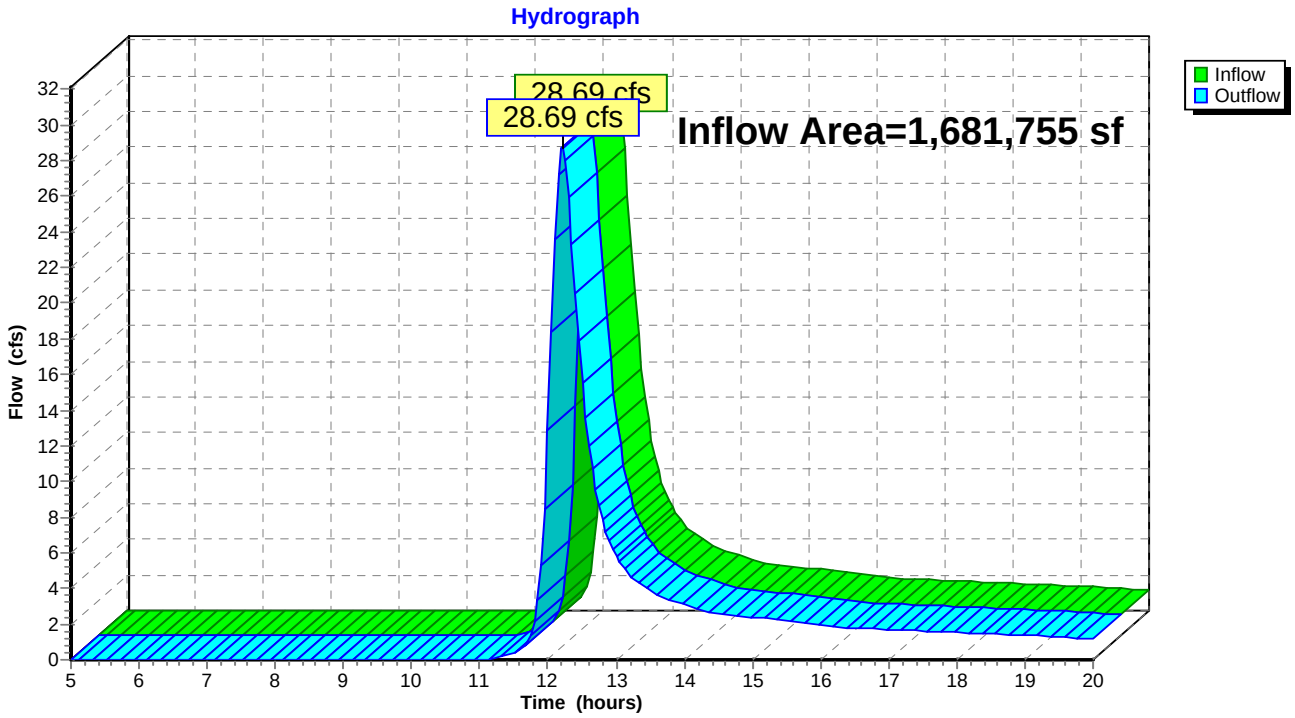
Summary for Reach 2R: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,681,755 sf, 0.20% Impervious, Inflow Depth > 0.84" for 50-yr event
Inflow = 28.69 cfs @ 12.21 hrs, Volume= 117,454 cf
Outflow = 28.69 cfs @ 12.21 hrs, Volume= 117,454 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Pre



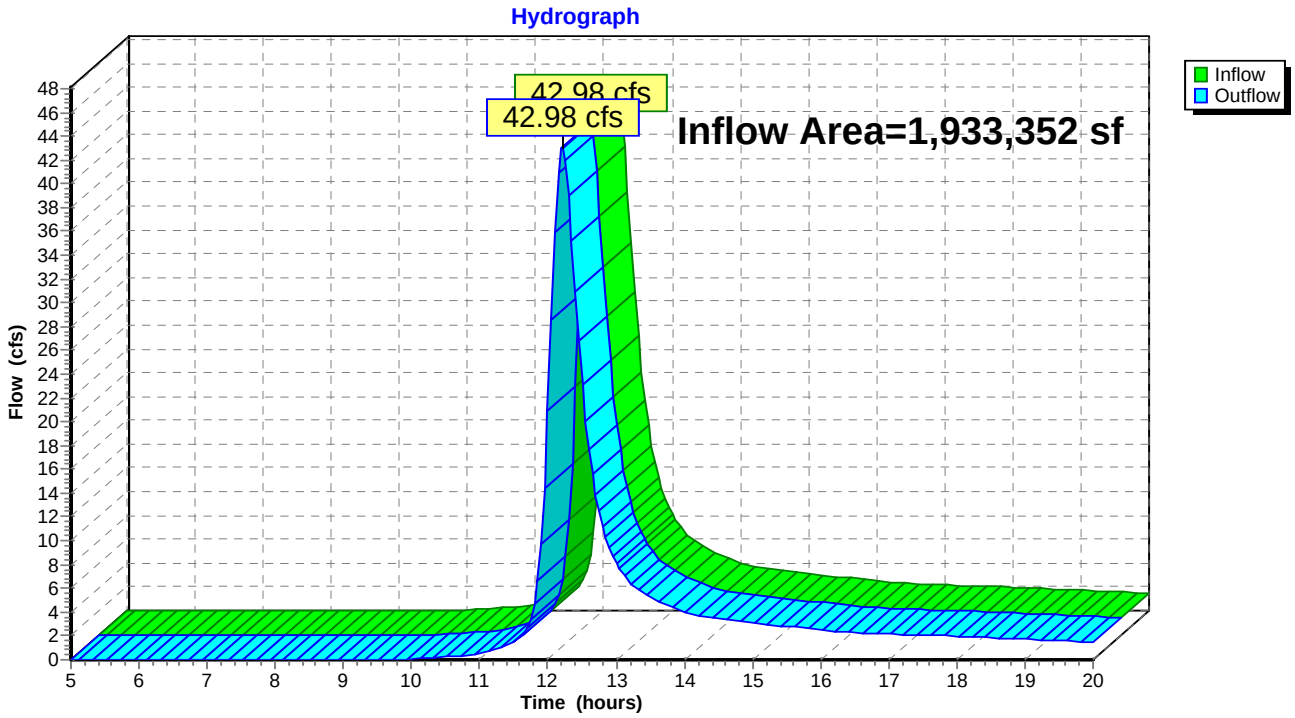
Summary for Reach 5R: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,933,352 sf, 0.18% Impervious, Inflow Depth > 1.06" for 50-yr event
Inflow = 42.98 cfs @ 12.21 hrs, Volume= 170,160 cf
Outflow = 42.98 cfs @ 12.21 hrs, Volume= 170,160 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Post



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>2.73"
Flow Length=1,175' Tc=20.1 min UI Adjusted CN=60 Runoff=18.22 cfs 55,491 cf

Subcatchment 2S: DA-2 Runoff Area=571,253 sf 0.00% Impervious Runoff Depth>3.33"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=66 Runoff=41.61 cfs 158,628 cf

Subcatchment 3S: DA-D Runoff Area=25.670 ac 0.00% Impervious Runoff Depth>0.25"
Flow Length=471' Slope=0.0600 '/' Tc=8.0 min CN=30 Runoff=1.55 cfs 23,064 cf

Subcatchment 6S: DA-1 Runoff Area=243,914 sf 1.40% Impervious Runoff Depth>2.53"
Flow Length=1,174' Tc=20.7 min UI Adjusted CN=58 Runoff=16.51 cfs 51,425 cf

Subcatchment 7S: DA-2 Runoff Area=475,165 sf 0.00% Impervious Runoff Depth>2.52"
Flow Length=1,455' Slope=0.0250 '/' Tc=29.5 min CN=58 Runoff=25.64 cfs 99,785 cf

Subcatchment 8S: DA-D Runoff Area=22.100 ac 0.00% Impervious Runoff Depth>0.25"
Flow Length=1,189' Tc=16.3 min CN=30 Runoff=1.28 cfs 19,661 cf

Reach 2R: Pre Inflow=41.14 cfs 170,872 cf
Outflow=41.14 cfs 170,872 cf

Reach 5R: Post Inflow=58.81 cfs 237,183 cf
Outflow=58.81 cfs 237,183 cf

Total Runoff Area = 3,615,107 sf Runoff Volume = 408,055 cf Average Runoff Depth = 1.35"
99.81% Pervious = 3,608,295 sf 0.19% Impervious = 6,812 sf

Summary for Subcatchment 1S: DA-1

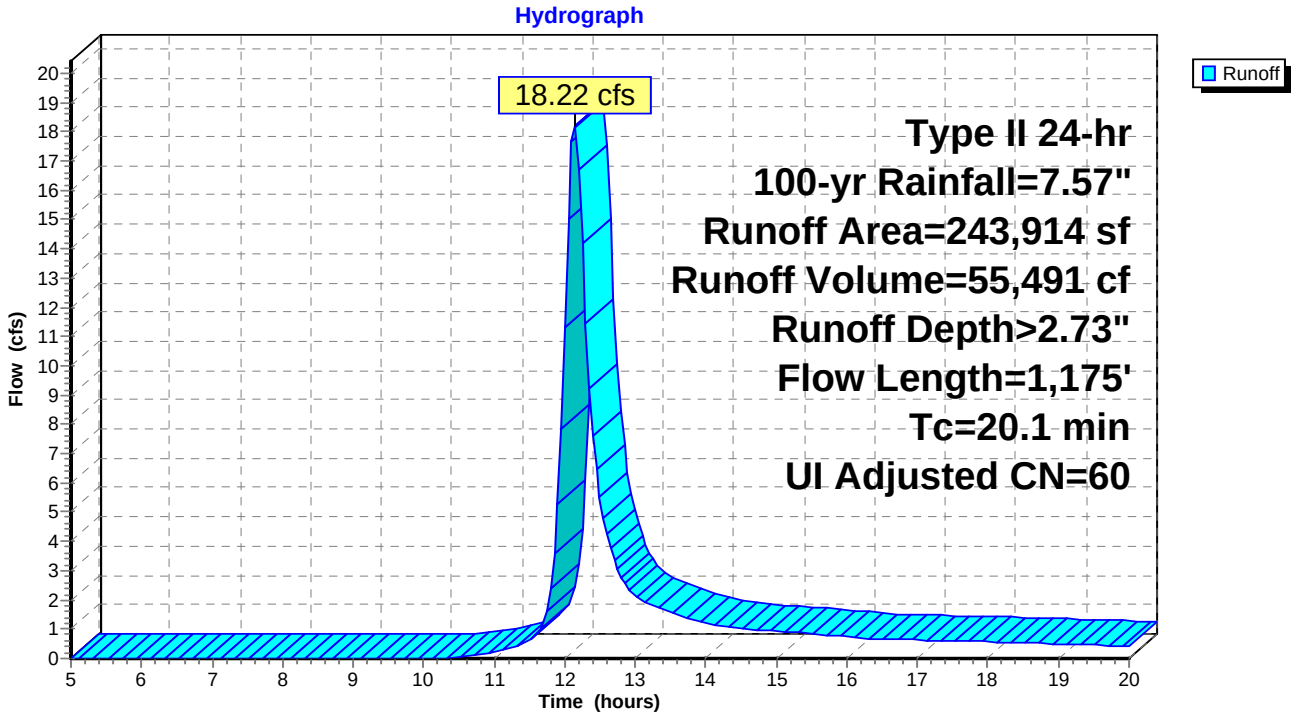
Runoff = 18.22 cfs @ 12.14 hrs, Volume= 55,491 cf, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.57"

	Area (sf)	CN	Adj	Description
	223,296	58		Meadow, non-grazed, HSG B
*	17,212	89		Gravel, HSG A
	3,406	98		Unconnected roofs, HSG A
	243,914	61	60	Weighted Average, UI Adjusted
	240,508			98.60% Pervious Area
	3,406			1.40% Impervious Area
	3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	50	0.0140	7.04	9.84	**Pipe Channel, Culvert** 16.0" Round Area= 1.4 sf Perim= 4.2' r= 0.33' n= 0.012 Concrete pipe, finished
1.6	111	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.1	1,175	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

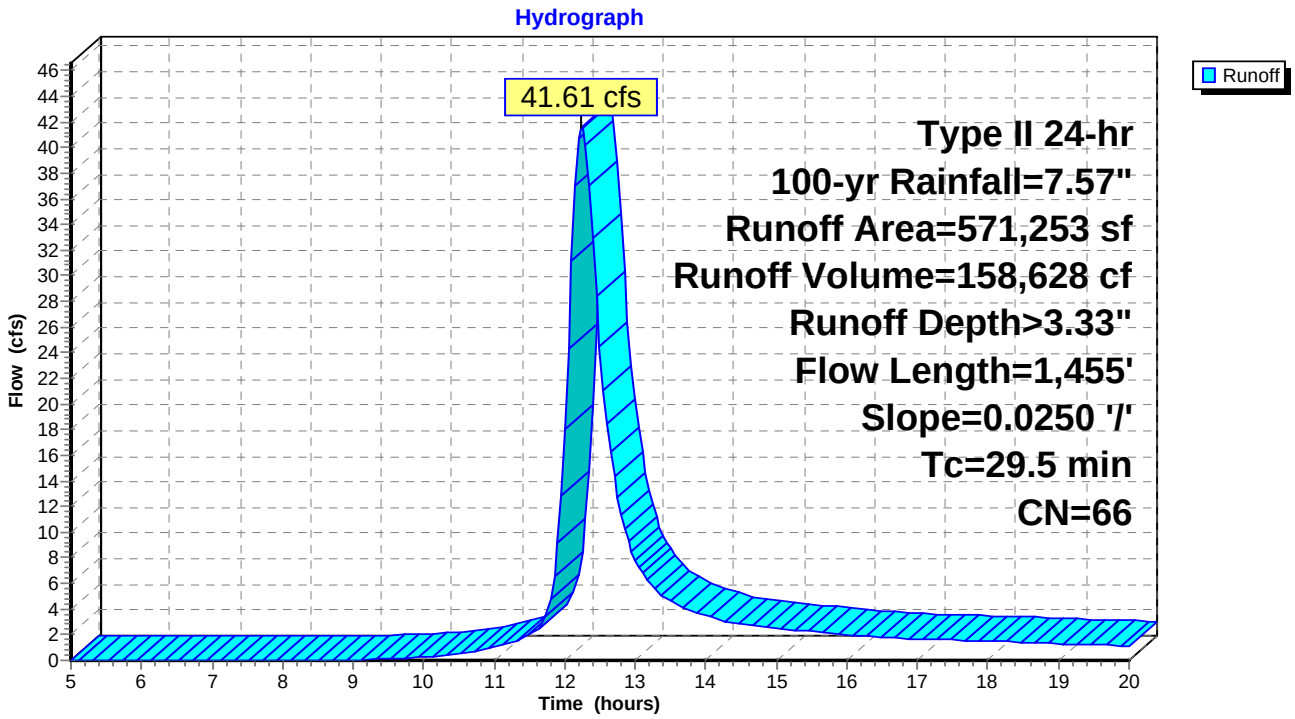
Runoff = 41.61 cfs @ 12.24 hrs, Volume= 158,628 cf, Depth> 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.57"

	Area (sf)	CN	Description
	422,572	58	Meadow, non-grazed, HSG B
*	148,681	89	Gravel, HSG A
	571,253	66	Weighted Average
	571,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-D

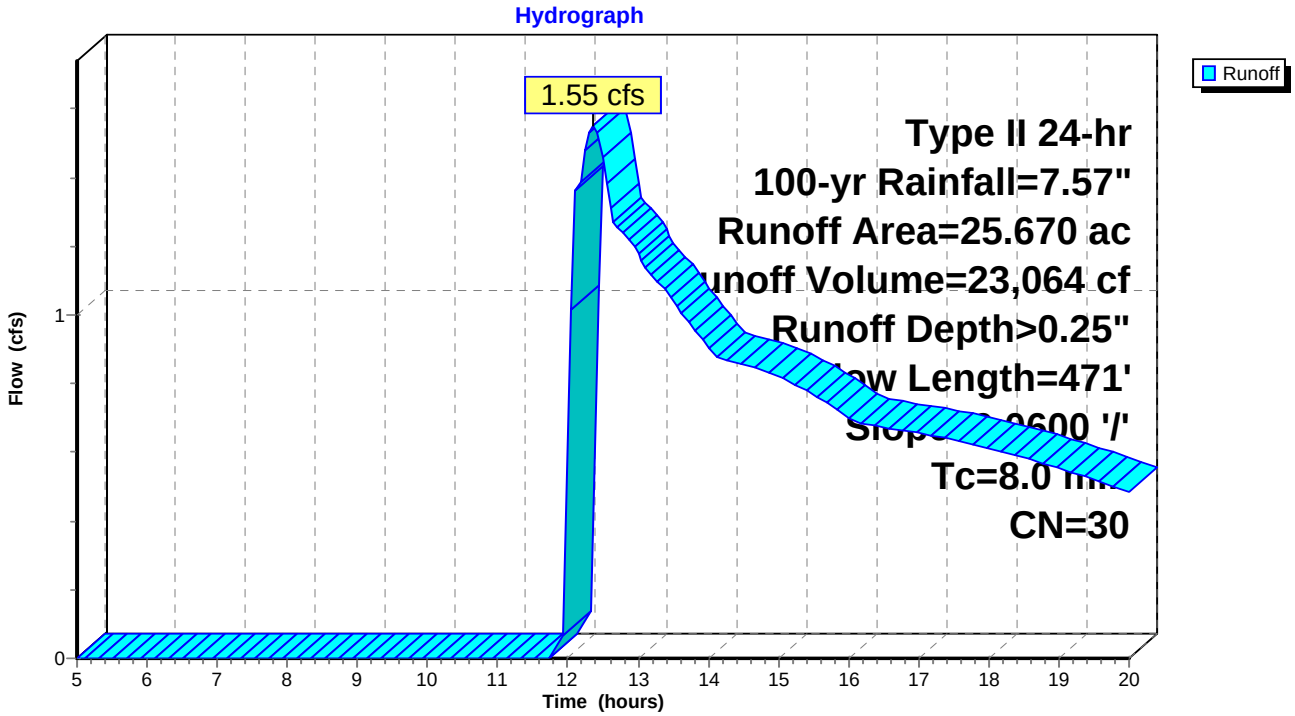
Runoff = 1.55 cfs @ 12.37 hrs, Volume= 23,064 cf, Depth> 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.57"

Area (ac)	CN	Description
25.670	30	Meadow, non-grazed, HSG A
25.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0600	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
1.6	371	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.0	471	Total			

Subcatchment 3S: DA-D



Summary for Subcatchment 6S: DA-1

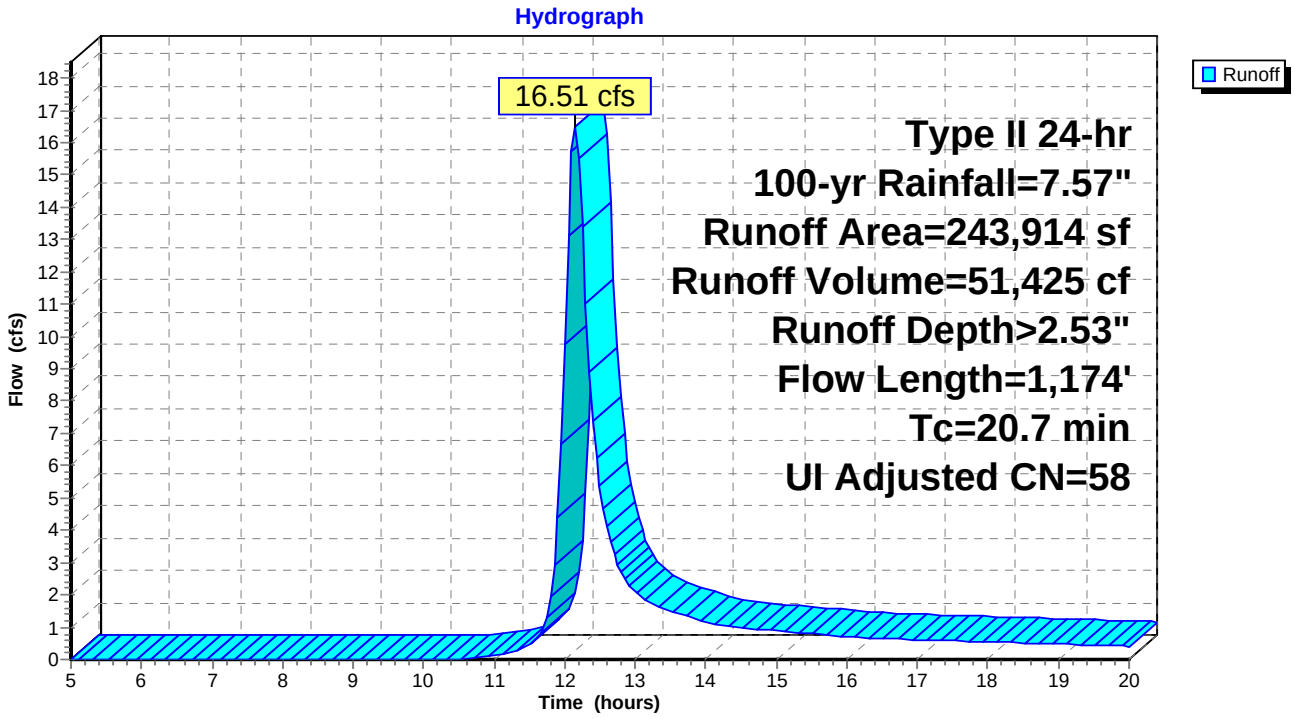
Runoff = 16.51 cfs @ 12.15 hrs, Volume= 51,425 cf, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.57"

Area (sf)	CN	Adj	Description
240,508	58		Meadow, non-grazed, HSG B
3,406	98		Unconnected roofs, HSG A
243,914	59	58	Weighted Average, UI Adjusted
240,508			98.60% Pervious Area
3,406			1.40% Impervious Area
3,406			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
13.2	914	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	160	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.7	1,174	Total			

Subcatchment 6S: DA-1



Summary for Subcatchment 7S: DA-2

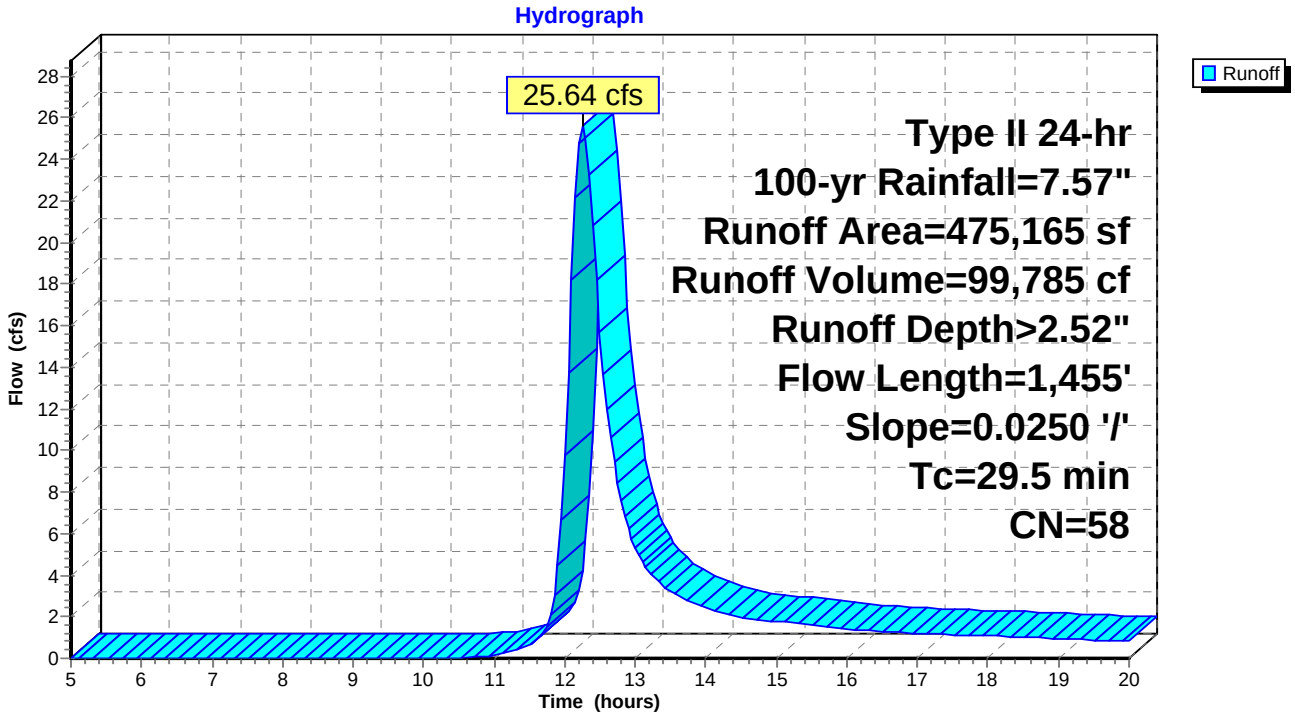
Runoff = 25.64 cfs @ 12.25 hrs, Volume= 99,785 cf, Depth> 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.57"

Area (sf)	CN	Description
475,165	58	Meadow, non-grazed, HSG B
475,165		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
20.4	1,355	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.5	1,455	Total			

Subcatchment 7S: DA-2



Summary for Subcatchment 8S: DA-D

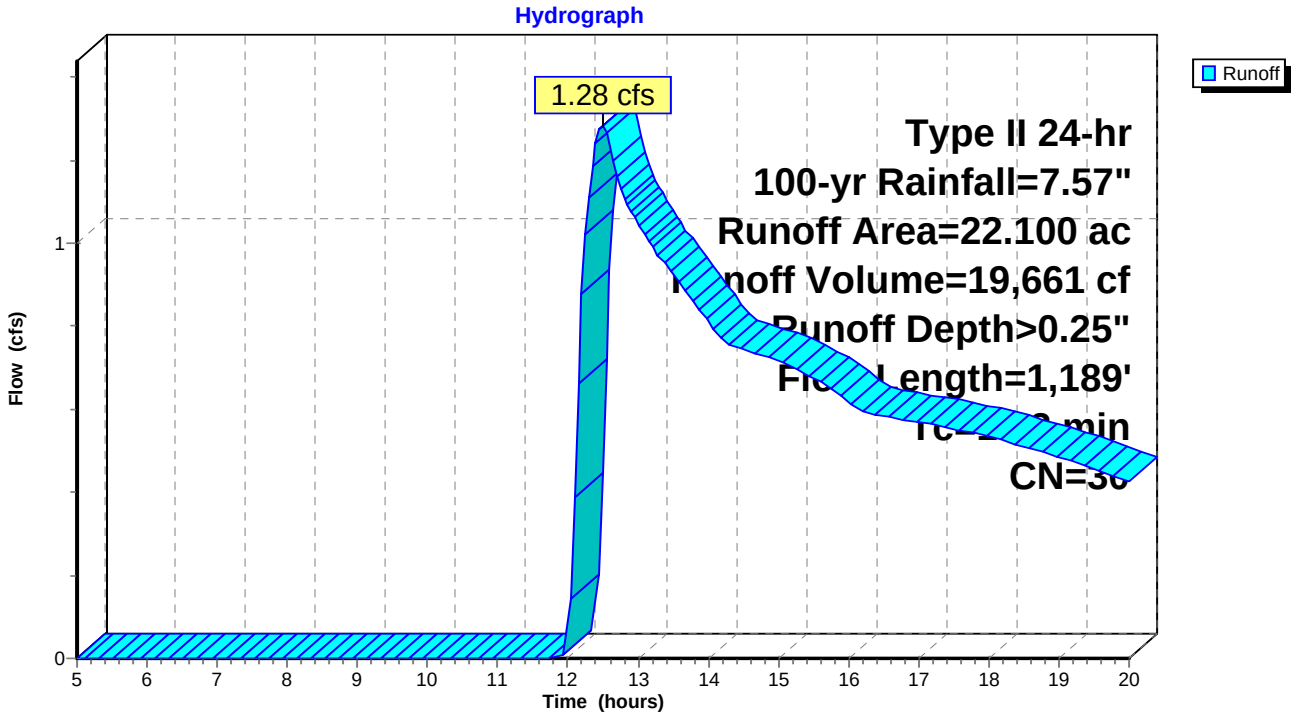
Runoff = 1.28 cfs @ 12.50 hrs, Volume= 19,661 cf, Depth> 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.57"

Area (ac)	CN	Description
22.100	30	Meadow, non-grazed, HSG A
22.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.12"
4.4	425	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	664	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.3	1,189	Total			

Subcatchment 8S: DA-D



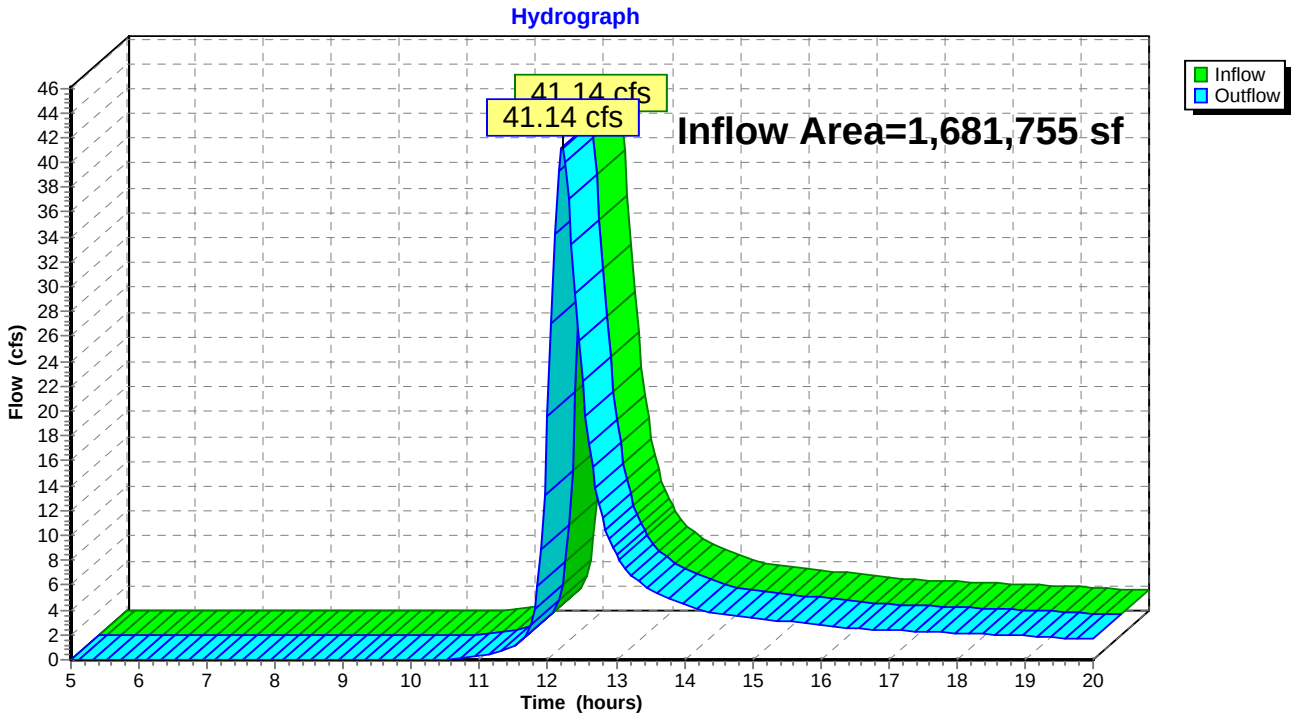
Summary for Reach 2R: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,681,755 sf, 0.20% Impervious, Inflow Depth > 1.22" for 100-yr event
Inflow = 41.14 cfs @ 12.21 hrs, Volume= 170,872 cf
Outflow = 41.14 cfs @ 12.21 hrs, Volume= 170,872 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Pre



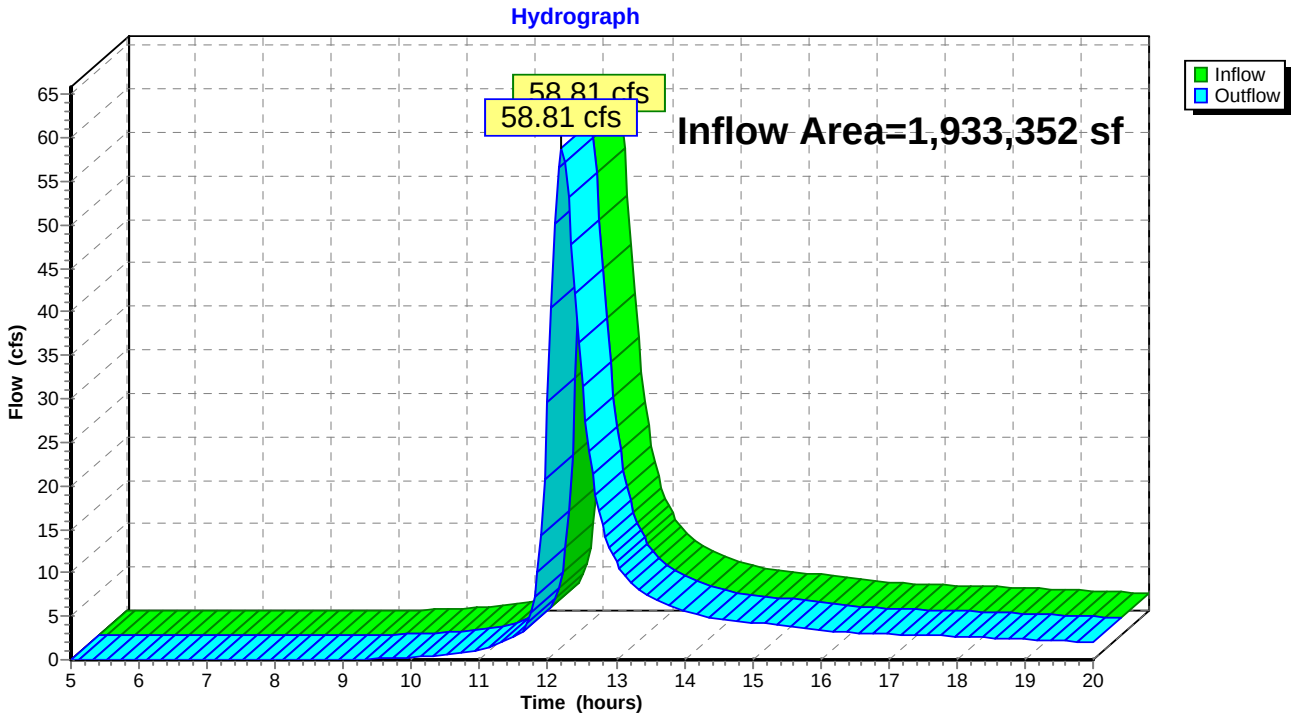
Summary for Reach 5R: Post

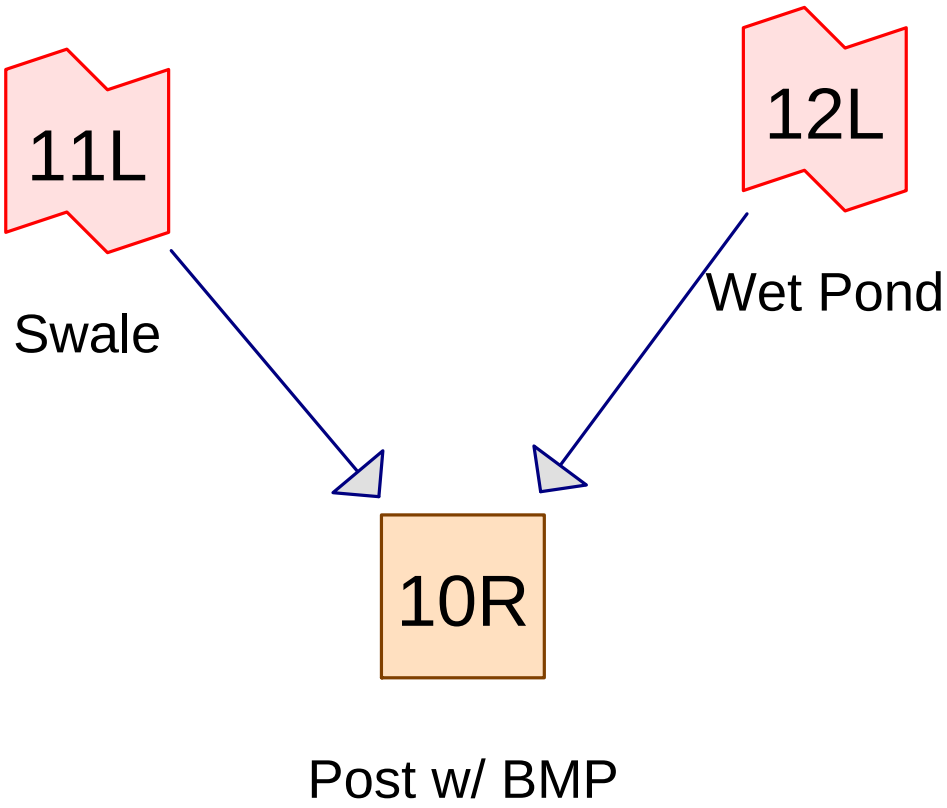
[40] Hint: Not Described (Outflow=Inflow)

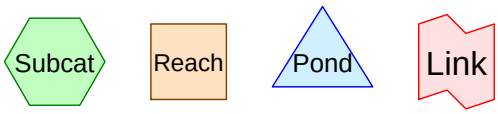
Inflow Area = 1,933,352 sf, 0.18% Impervious, Inflow Depth > 1.47" for 100-yr event
Inflow = 58.81 cfs @ 12.20 hrs, Volume= 237,183 cf
Outflow = 58.81 cfs @ 12.20 hrs, Volume= 237,183 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Post







Routing Diagram for Post with Bmps
Prepared by {enter your company name here}, Printed 5/29/2020
HydroCAD® 10.00-20 s/n 09710 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.000	**0**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.000		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**TOTAL AREA**	

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 10R: Post w/ BMP Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Link 11L: 1-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce Inflow=0.00 cfs 0.000 af
Area= 6.544 ac 27.48% Imperv. Primary=0.00 cfs 0.000 af

Link 12L: Wet 1-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce Inflow=0.00 cfs 0.000 af
Area= 9.190 ac 16.58% Imperv. Primary=0.00 cfs 0.000 af

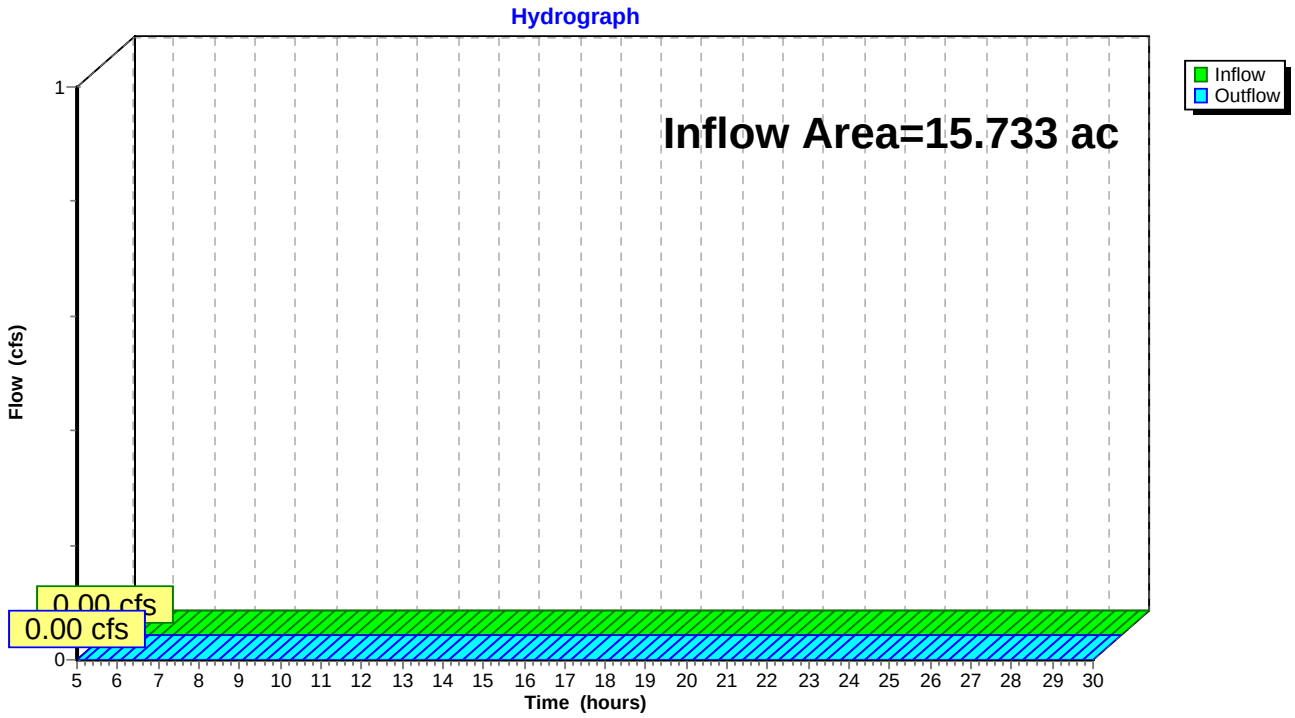
Summary for Reach 10R: Post w/ BMP

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 15.733 ac, 21.11% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/ BMP



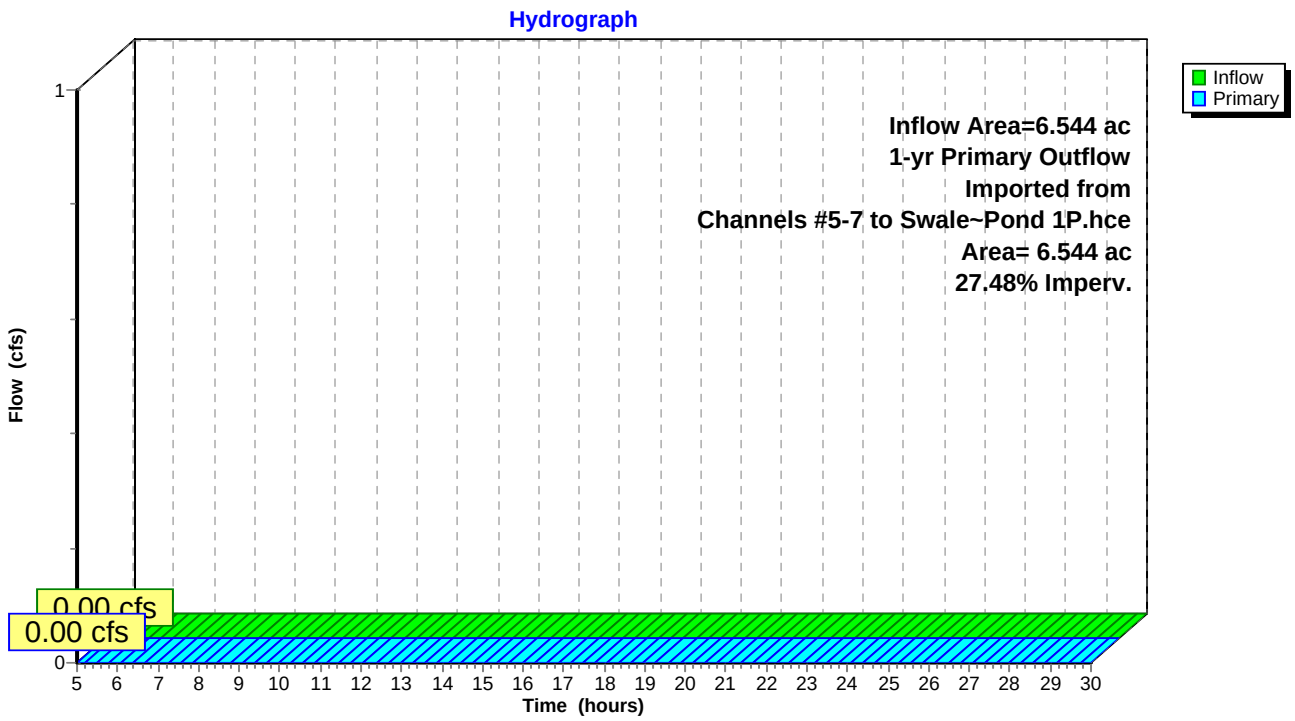
Summary for Link 11L: Swale

Inflow Area = 6.544 ac, 27.48% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

1-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce

Link 11L: Swale



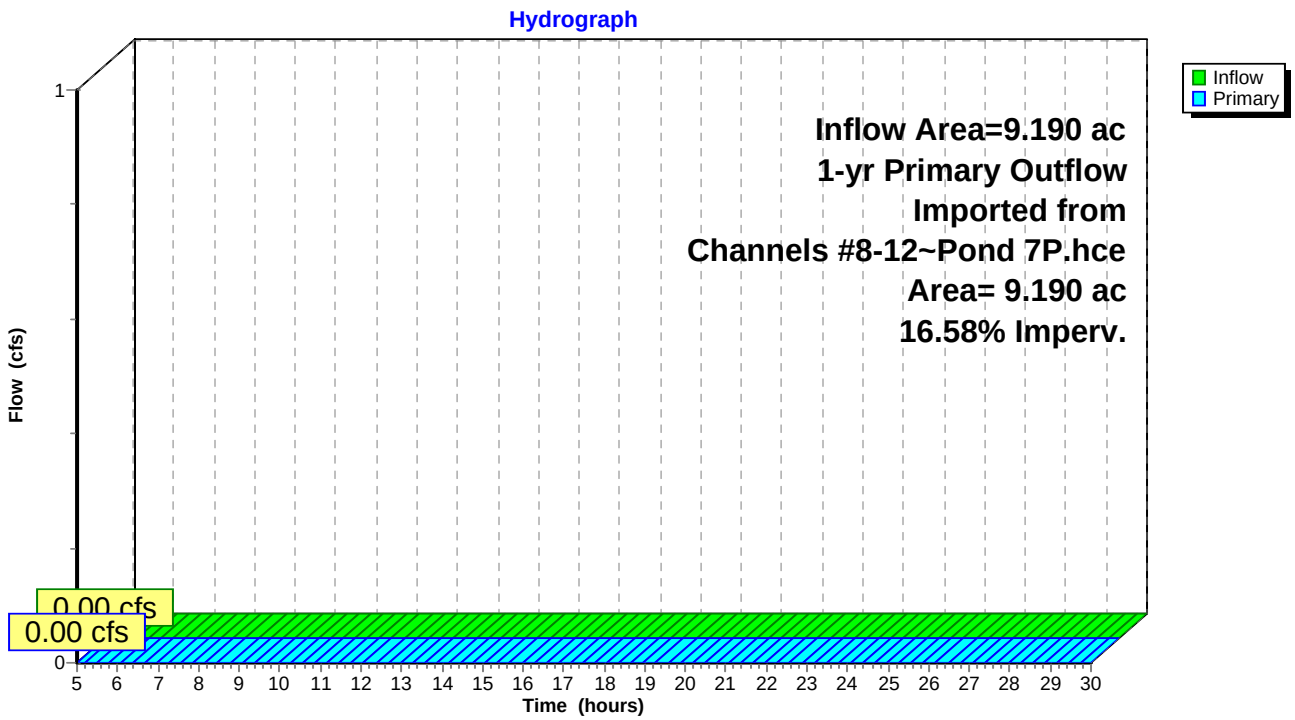
Summary for Link 12L: Wet Pond

Inflow Area = 9.190 ac, 16.58% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

1-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce

Link 12L: Wet Pond



Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 10R: Post w/ BMP Inflow=0.05 cfs 0.013 af
Outflow=0.05 cfs 0.013 af

Link 11L: 2-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce Inflow=0.05 cfs 0.013 af
Area= 6.544 ac 27.48% Imperv. Primary=0.05 cfs 0.013 af

Link 12L: Wet 2-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce Inflow=0.00 cfs 0.000 af
Area= 9.190 ac 16.58% Imperv. Primary=0.00 cfs 0.000 af

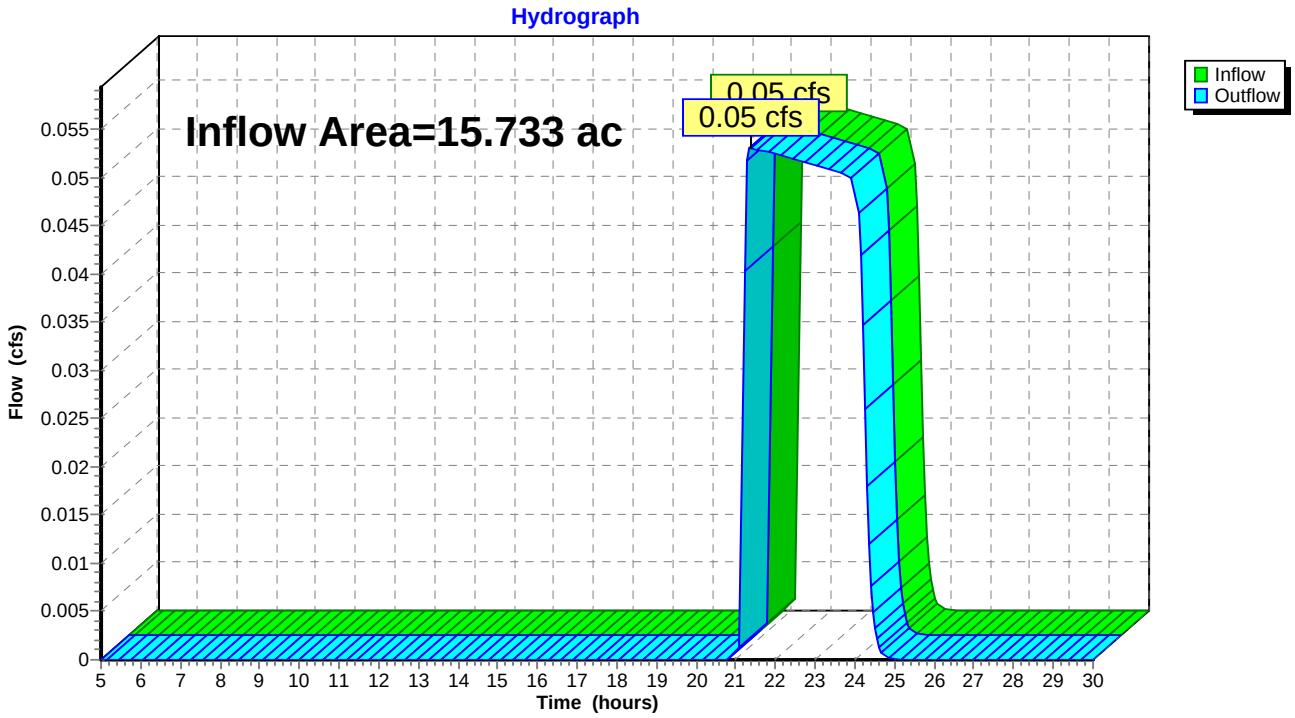
Summary for Reach 10R: Post w/ BMP

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 15.733 ac, 21.11% Impervious, Inflow Depth = 0.01" for 2-yr event
Inflow = 0.05 cfs @ 21.38 hrs, Volume= 0.013 af
Outflow = 0.05 cfs @ 21.38 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/ BMP



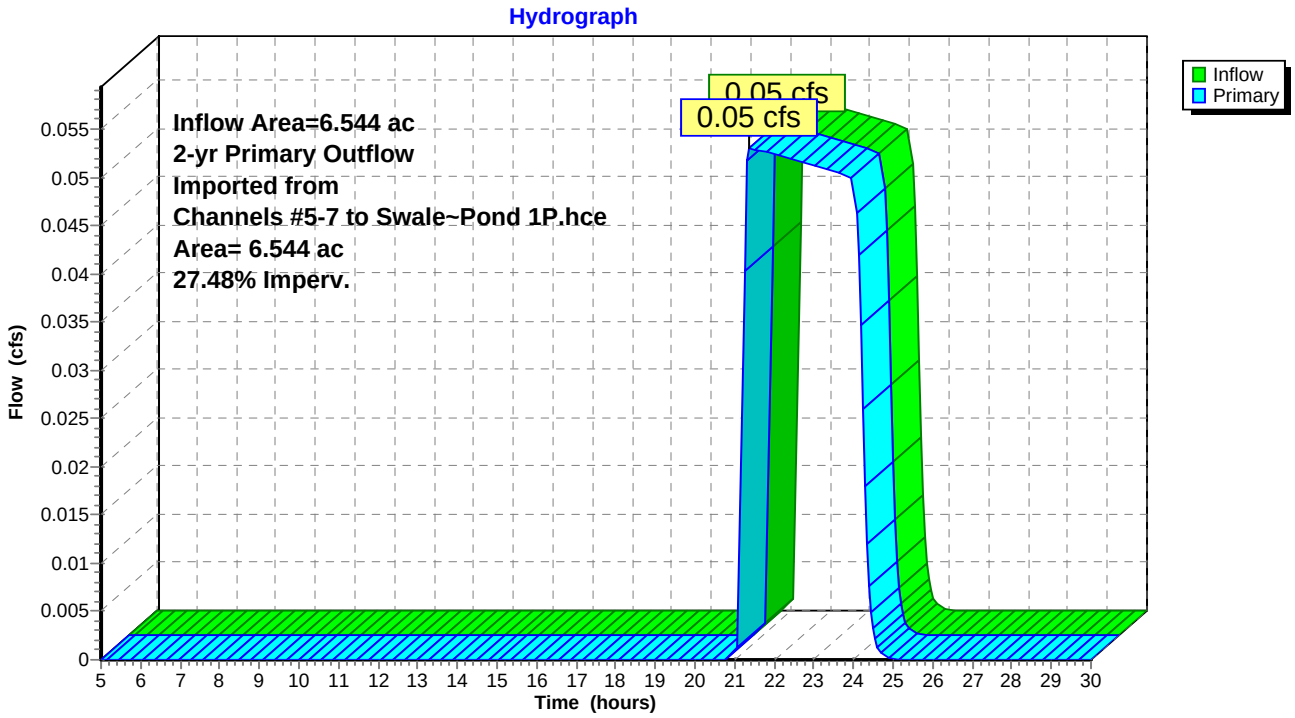
Summary for Link 11L: Swale

Inflow Area = 6.544 ac, 27.48% Impervious, Inflow Depth = 0.02" for 2-yr event
Inflow = 0.05 cfs @ 21.38 hrs, Volume= 0.013 af
Primary = 0.05 cfs @ 21.38 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

2-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce

Link 11L: Swale



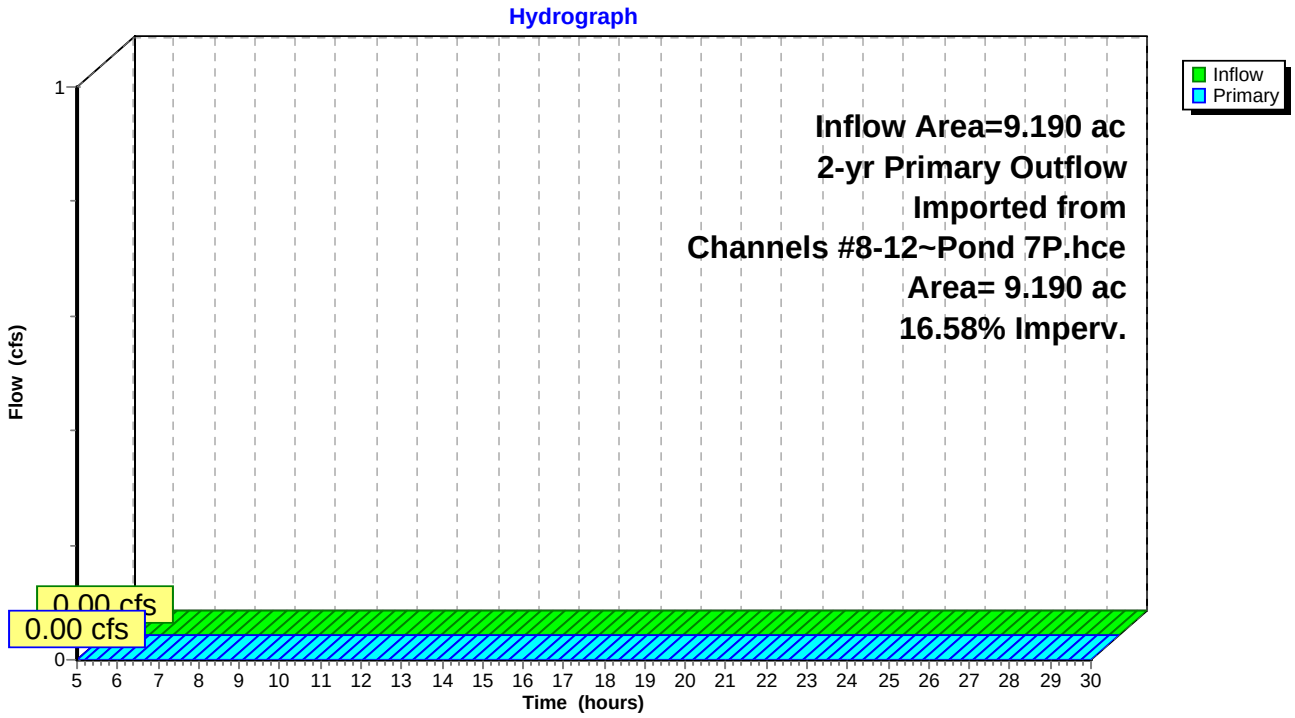
Summary for Link 12L: Wet Pond

Inflow Area = 9.190 ac, 16.58% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

2-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce

Link 12L: Wet Pond



Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 10R: Post w/ BMP Inflow=1.48 cfs 0.234 af
Outflow=1.48 cfs 0.234 af

Link 11L: 10-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce Inflow=1.48 cfs 0.234 af
Area= 6.544 ac 27.48% Imperv. Primary=1.48 cfs 0.234 af

Link 12L: Wet 10-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce Inflow=0.00 cfs 0.000 af
Area= 9.190 ac 16.58% Imperv. Primary=0.00 cfs 0.000 af

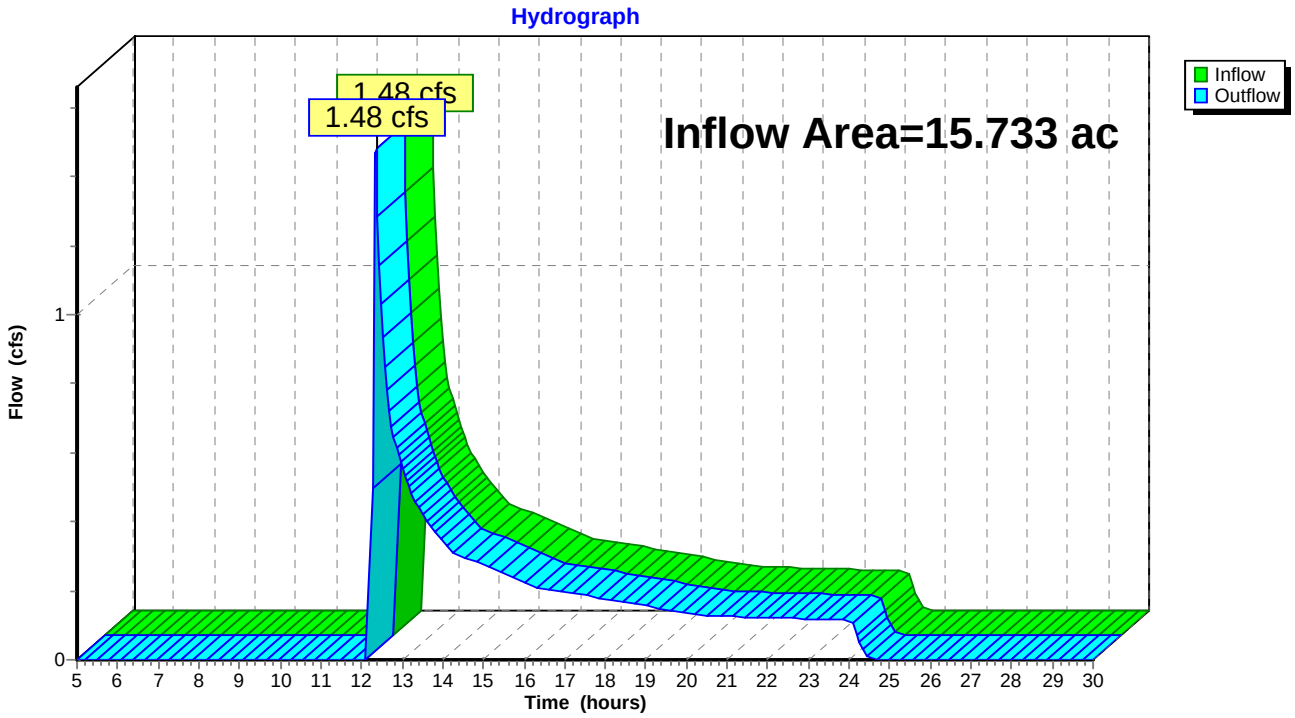
Summary for Reach 10R: Post w/ BMP

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 15.733 ac, 21.11% Impervious, Inflow Depth = 0.18" for 10-yr event
Inflow = 1.48 cfs @ 12.36 hrs, Volume= 0.234 af
Outflow = 1.48 cfs @ 12.36 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/ BMP



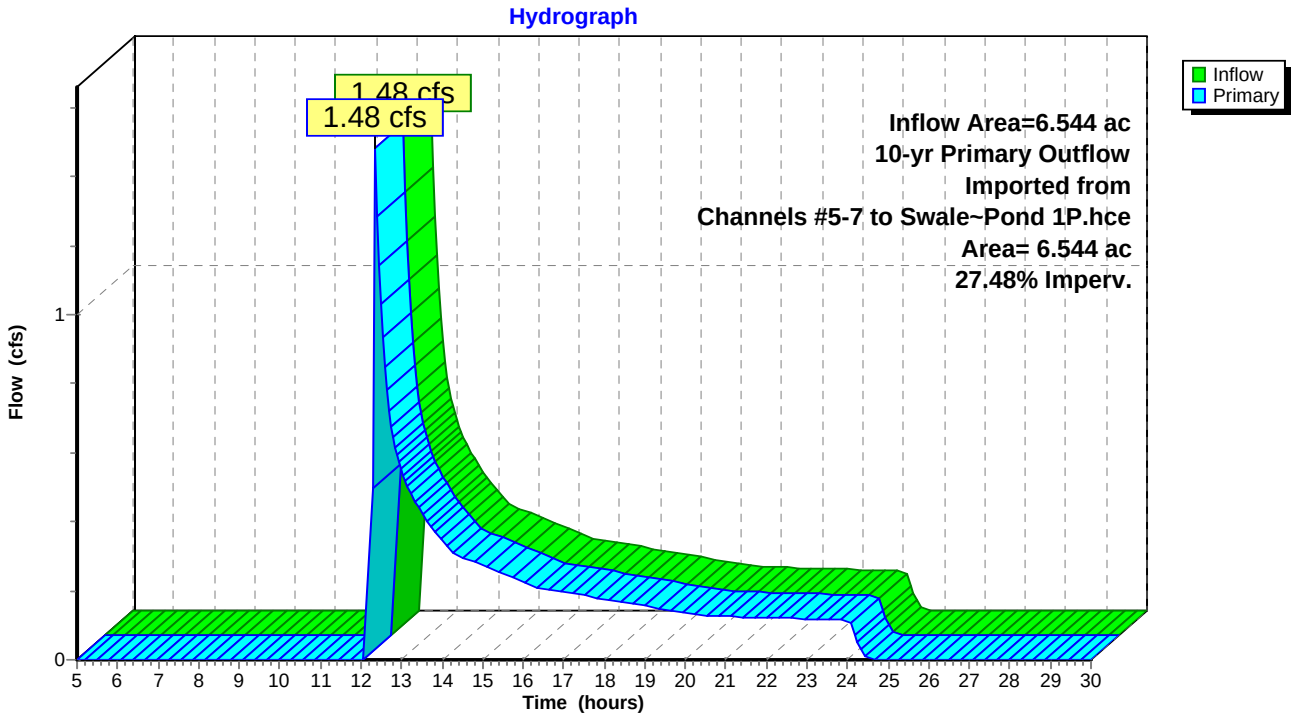
Summary for Link 11L: Swale

Inflow Area = 6.544 ac, 27.48% Impervious, Inflow Depth = 0.43" for 10-yr event
Inflow = 1.48 cfs @ 12.36 hrs, Volume= 0.234 af
Primary = 1.48 cfs @ 12.36 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

10-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce

Link 11L: Swale



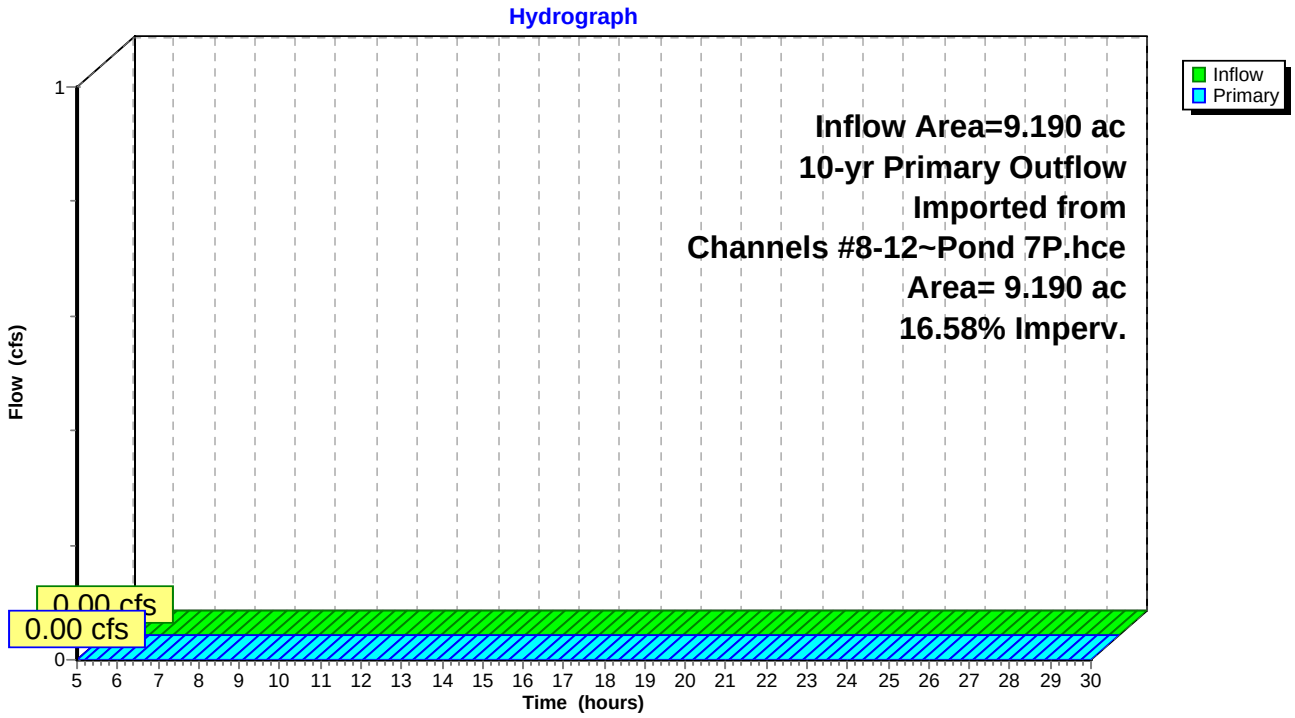
Summary for Link 12L: Wet Pond

Inflow Area = 9.190 ac, 16.58% Impervious, Inflow Depth = 0.00" for 10-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

10-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce

Link 12L: Wet Pond



Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 10R: Post w/ BMP Inflow=8.09 cfs 0.459 af
Outflow=8.09 cfs 0.459 af

Link 11L: 25-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce Inflow=8.09 cfs 0.459 af
Area= 6.544 ac 27.48% Imperv. Primary=8.09 cfs 0.459 af

Link 12L: Wet 25-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce Inflow=0.00 cfs 0.000 af
Area= 9.190 ac 16.58% Imperv. Primary=0.00 cfs 0.000 af

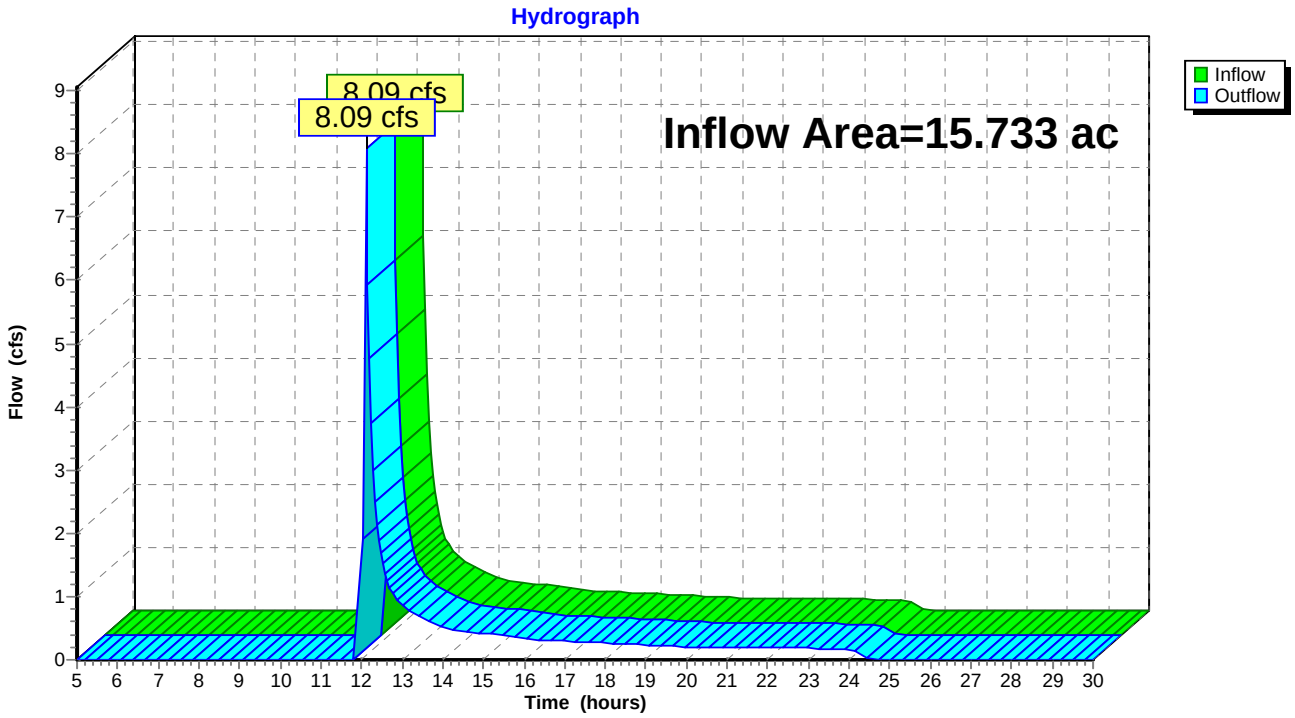
Summary for Reach 10R: Post w/ BMP

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 15.733 ac, 21.11% Impervious, Inflow Depth = 0.35" for 25-yr event
Inflow = 8.09 cfs @ 12.12 hrs, Volume= 0.459 af
Outflow = 8.09 cfs @ 12.12 hrs, Volume= 0.459 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/ BMP



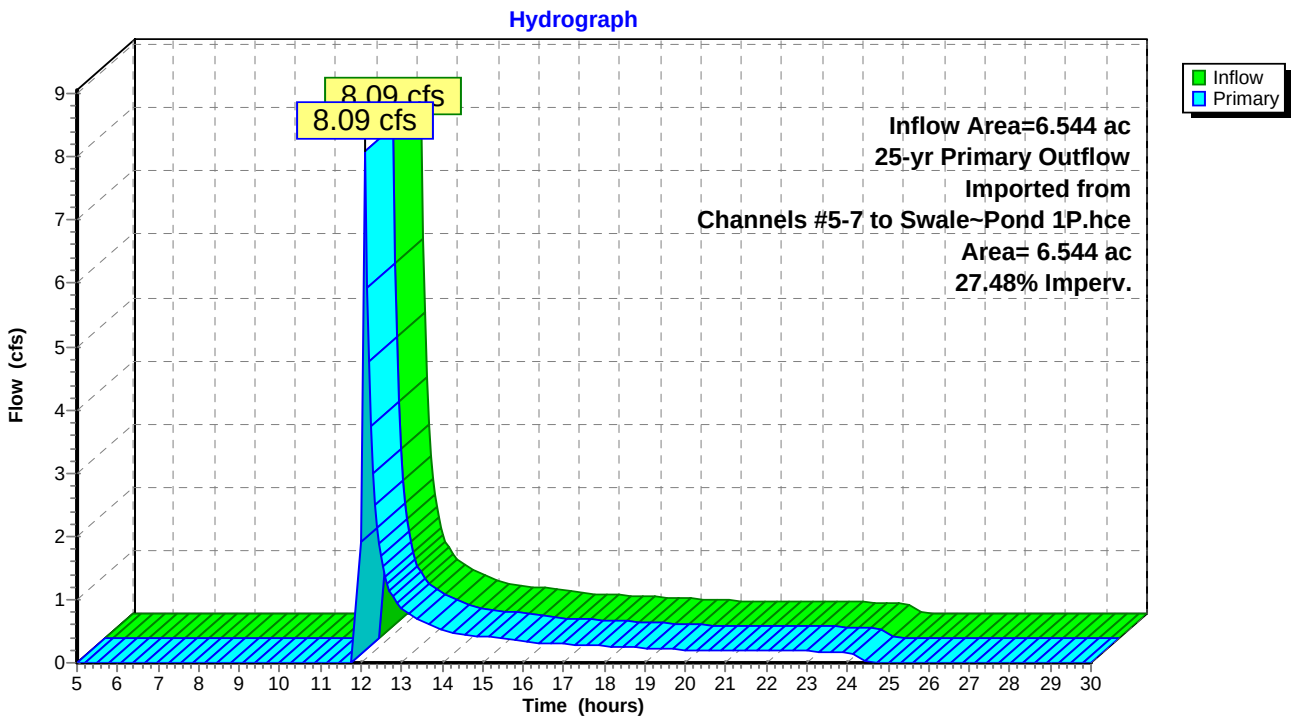
Summary for Link 11L: Swale

Inflow Area = 6.544 ac, 27.48% Impervious, Inflow Depth = 0.84" for 25-yr event
Inflow = 8.09 cfs @ 12.12 hrs, Volume= 0.459 af
Primary = 8.09 cfs @ 12.12 hrs, Volume= 0.459 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

25-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce

Link 11L: Swale



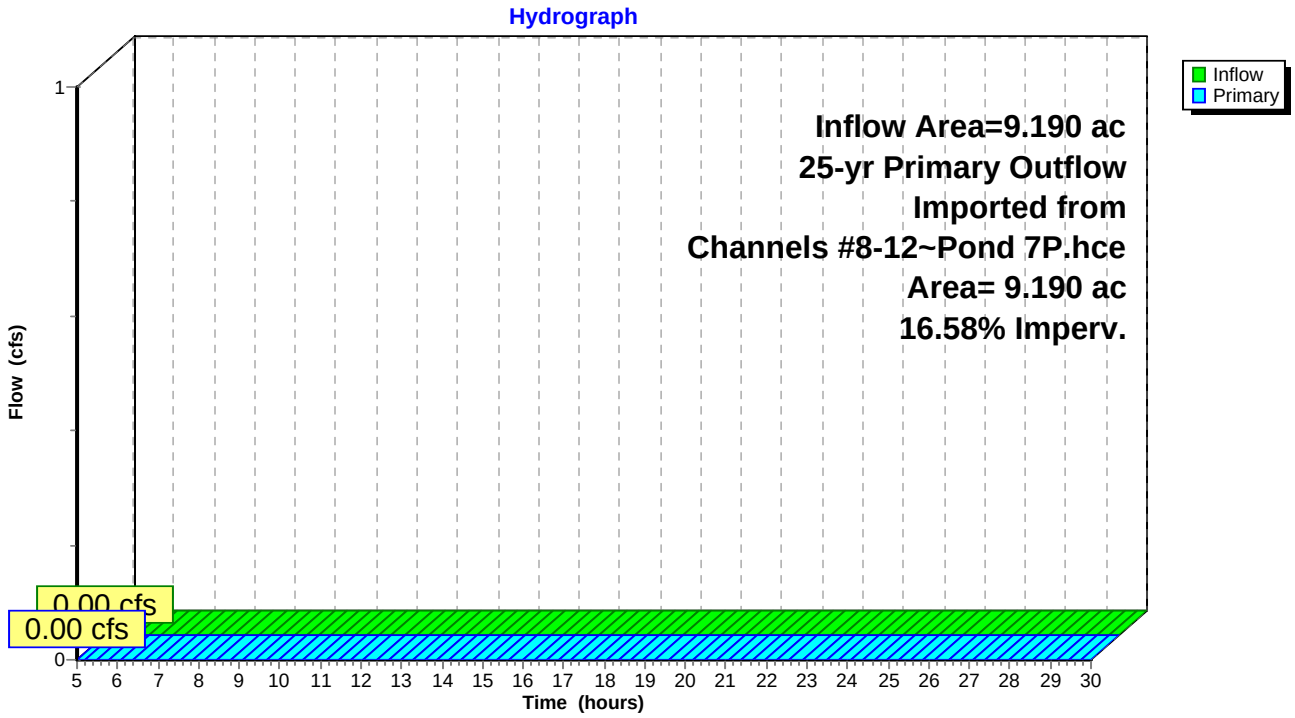
Summary for Link 12L: Wet Pond

Inflow Area = 9.190 ac, 16.58% Impervious, Inflow Depth = 0.00" for 25-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

25-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce

Link 12L: Wet Pond



Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 10R: Post w/ BMP Inflow=10.23 cfs 0.674 af
Outflow=10.23 cfs 0.674 af

Link 11L: 50-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce Inflow=10.23 cfs 0.674 af
Area= 6.544 ac 27.48% Imperv. Primary=10.23 cfs 0.674 af

Link 12L: Wet 50-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce Inflow=0.00 cfs 0.000 af
Area= 9.190 ac 16.58% Imperv. Primary=0.00 cfs 0.000 af

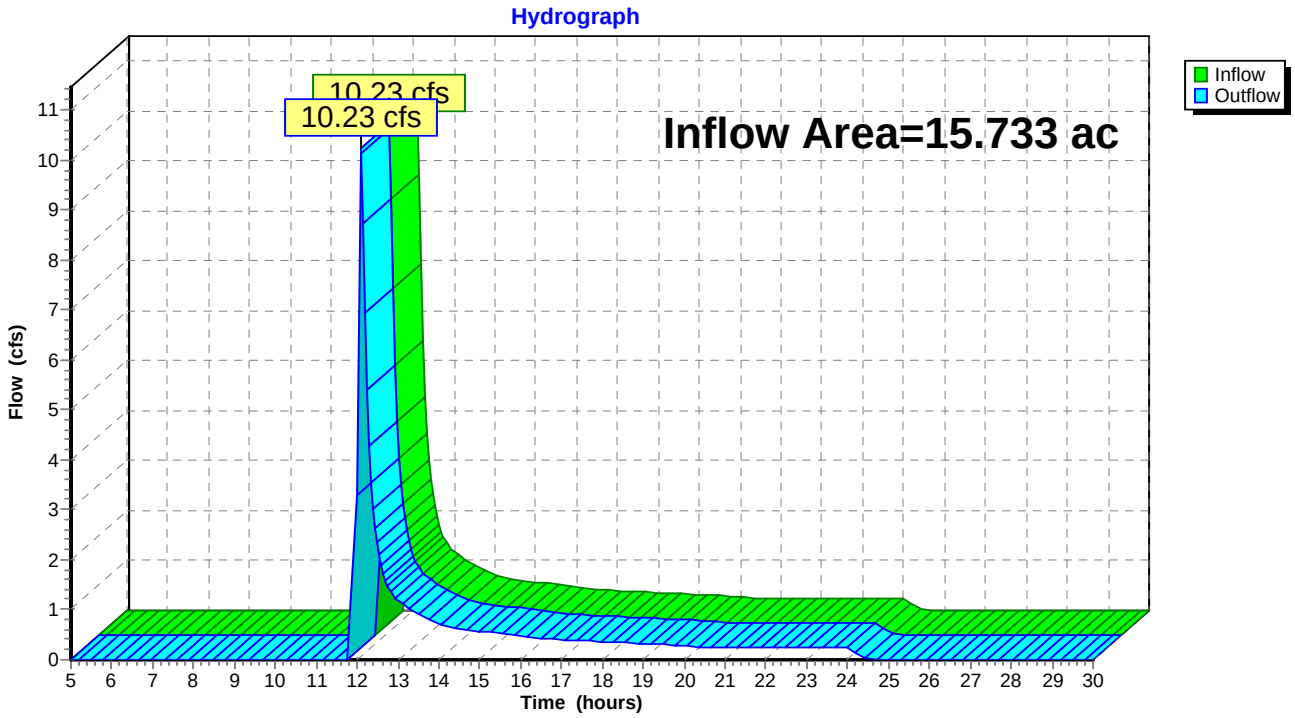
Summary for Reach 10R: Post w/ BMP

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 15.733 ac, 21.11% Impervious, Inflow Depth = 0.51" for 50-yr event
Inflow = 10.23 cfs @ 12.08 hrs, Volume= 0.674 af
Outflow = 10.23 cfs @ 12.08 hrs, Volume= 0.674 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/ BMP



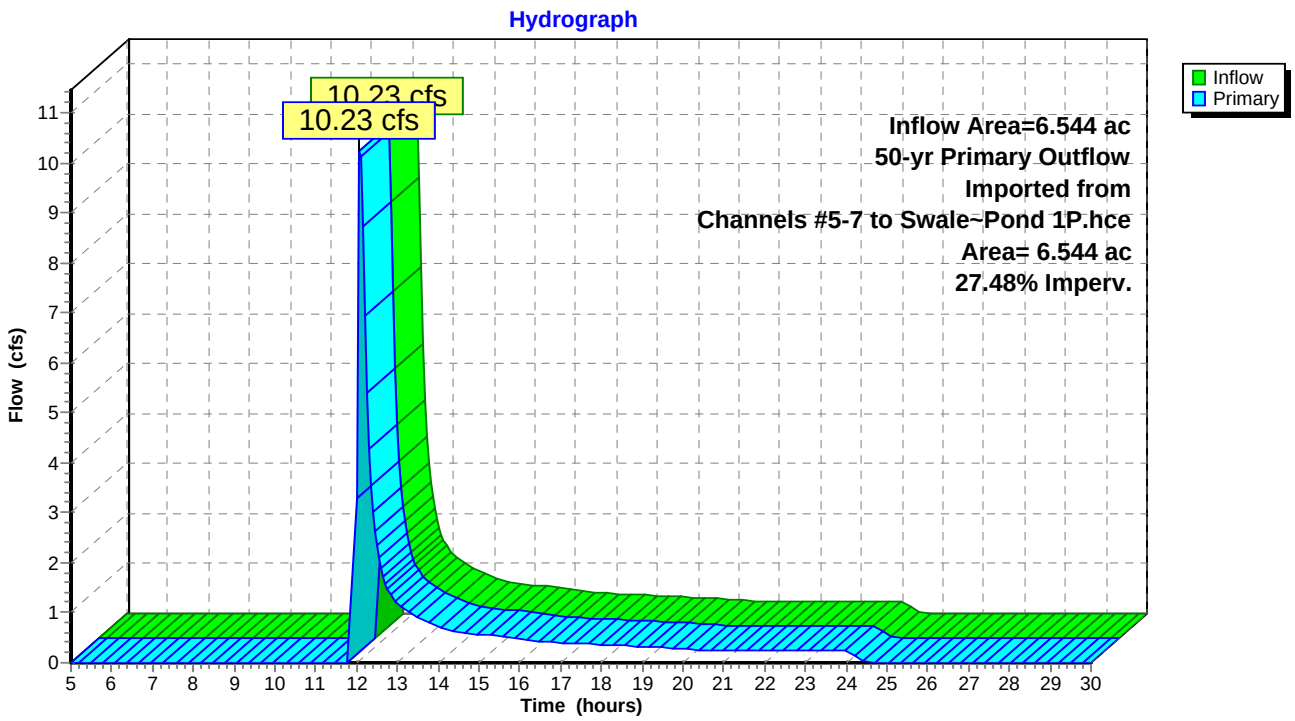
Summary for Link 11L: Swale

Inflow Area = 6.544 ac, 27.48% Impervious, Inflow Depth = 1.24" for 50-yr event
Inflow = 10.23 cfs @ 12.08 hrs, Volume= 0.674 af
Primary = 10.23 cfs @ 12.08 hrs, Volume= 0.674 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

50-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce

Link 11L: Swale



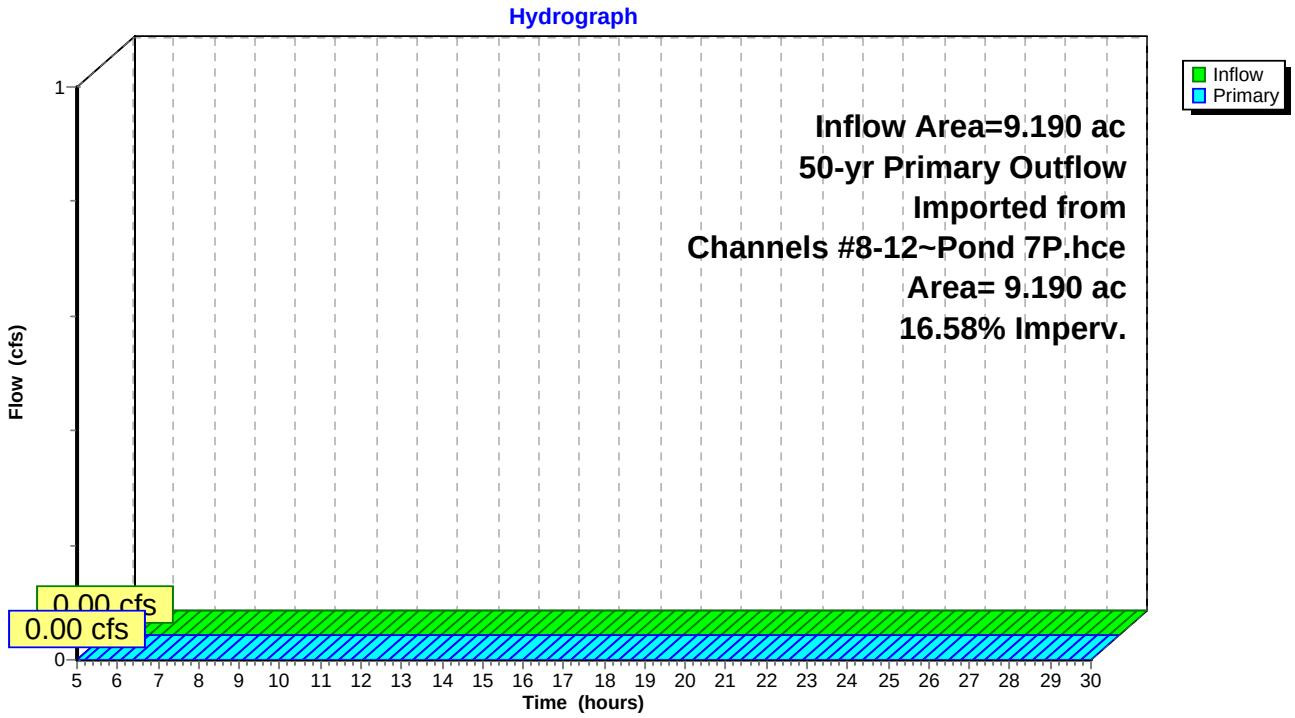
Summary for Link 12L: Wet Pond

Inflow Area = 9.190 ac, 16.58% Impervious, Inflow Depth = 0.00" for 50-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

50-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce

Link 12L: Wet Pond



Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 10R: Post w/ BMP Inflow=14.84 cfs 1.038 af
Outflow=14.84 cfs 1.038 af

Link 100-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce Inflow=14.84 cfs 1.002 af
Area= 6.544 ac 27.48% Imperv. Primary=14.84 cfs 1.002 af

Link 12L: Wet 100-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce Inflow=0.04 cfs 0.036 af
Area= 9.190 ac 16.58% Imperv. Primary=0.04 cfs 0.036 af

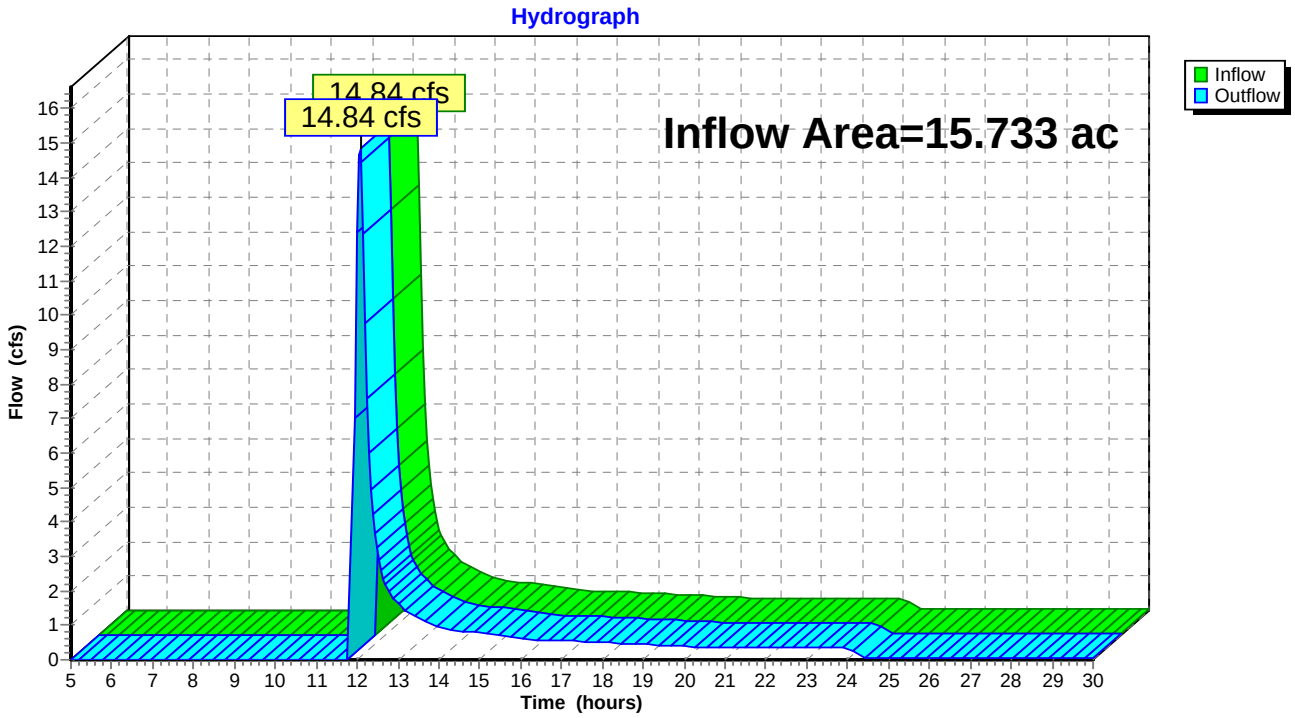
Summary for Reach 10R: Post w/ BMP

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 15.733 ac, 21.11% Impervious, Inflow Depth > 0.79" for 100-yr event
Inflow = 14.84 cfs @ 12.07 hrs, Volume= 1.038 af
Outflow = 14.84 cfs @ 12.07 hrs, Volume= 1.038 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: Post w/ BMP



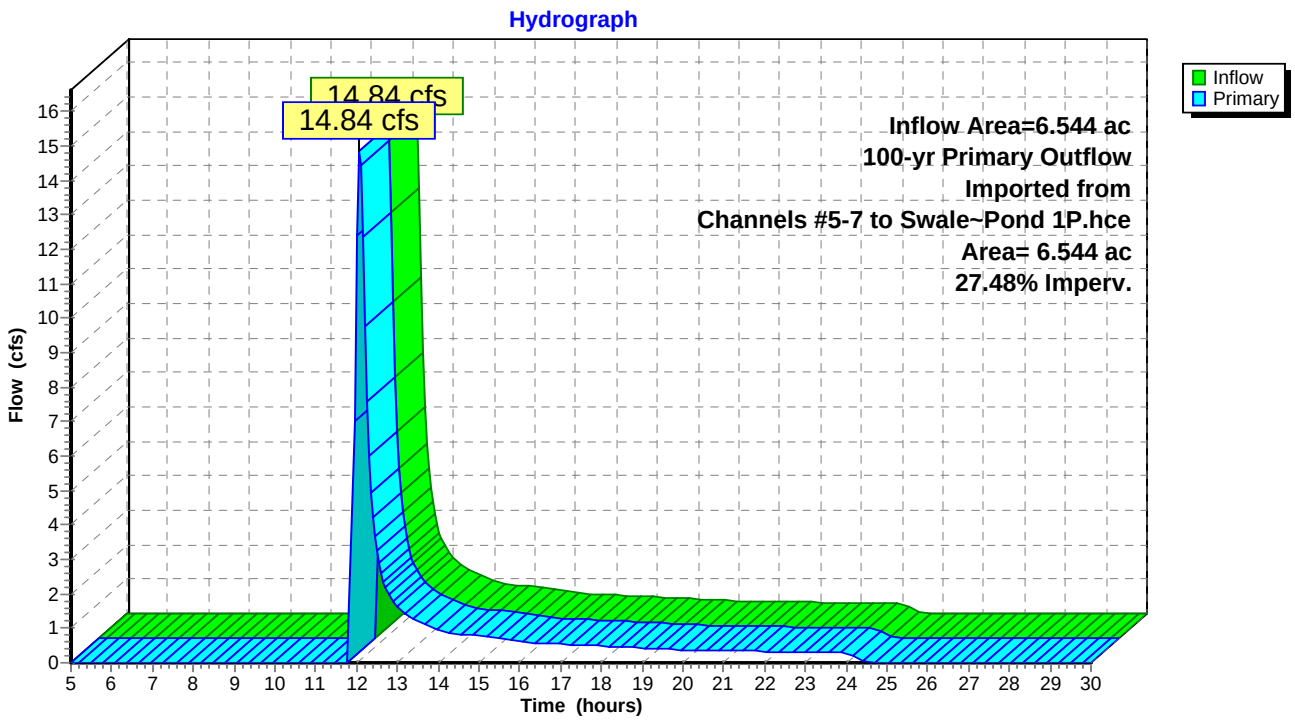
Summary for Link 11L: Swale

Inflow Area = 6.544 ac, 27.48% Impervious, Inflow Depth = 1.84" for 100-yr event
Inflow = 14.84 cfs @ 12.07 hrs, Volume= 1.002 af
Primary = 14.84 cfs @ 12.07 hrs, Volume= 1.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

100-yr Primary Outflow Imported from Channels #5-7 to Swale~Pond 1P.hce

Link 11L: Swale



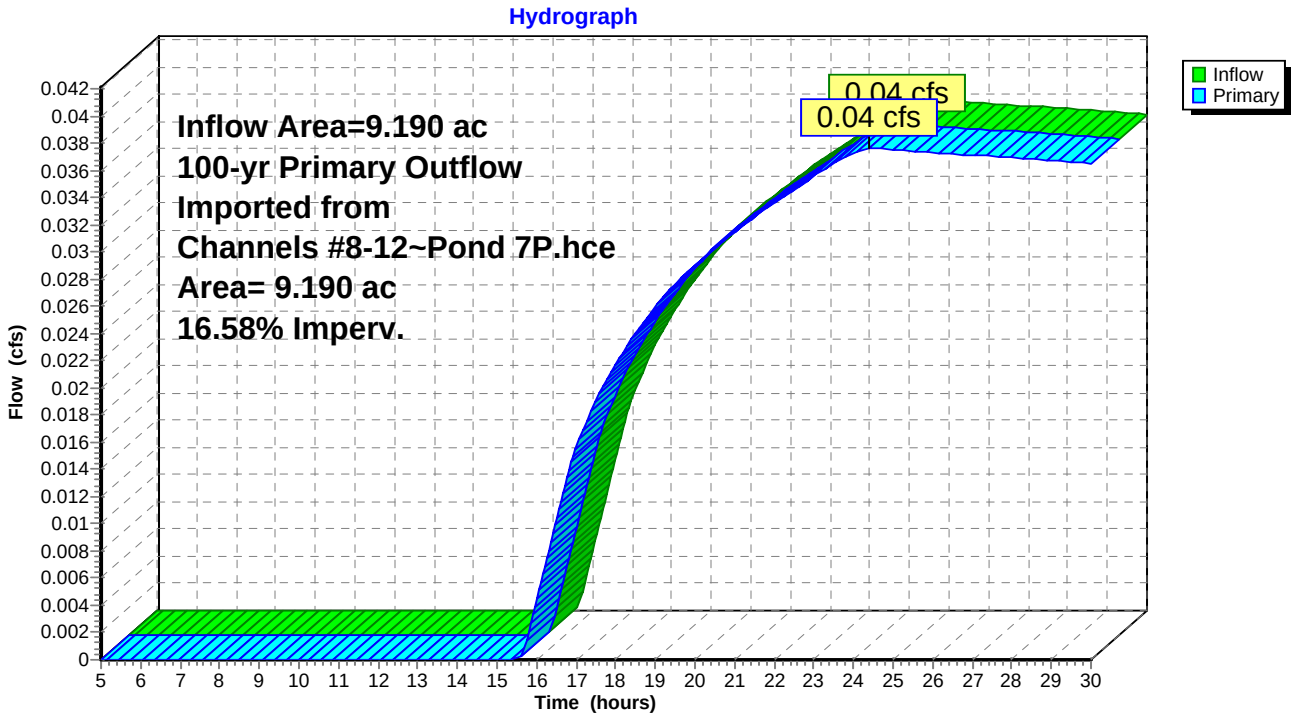
Summary for Link 12L: Wet Pond

Inflow Area = 9.190 ac, 16.58% Impervious, Inflow Depth > 0.05" for 100-yr event
Inflow = 0.04 cfs @ 24.41 hrs, Volume= 0.036 af
Primary = 0.04 cfs @ 24.41 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

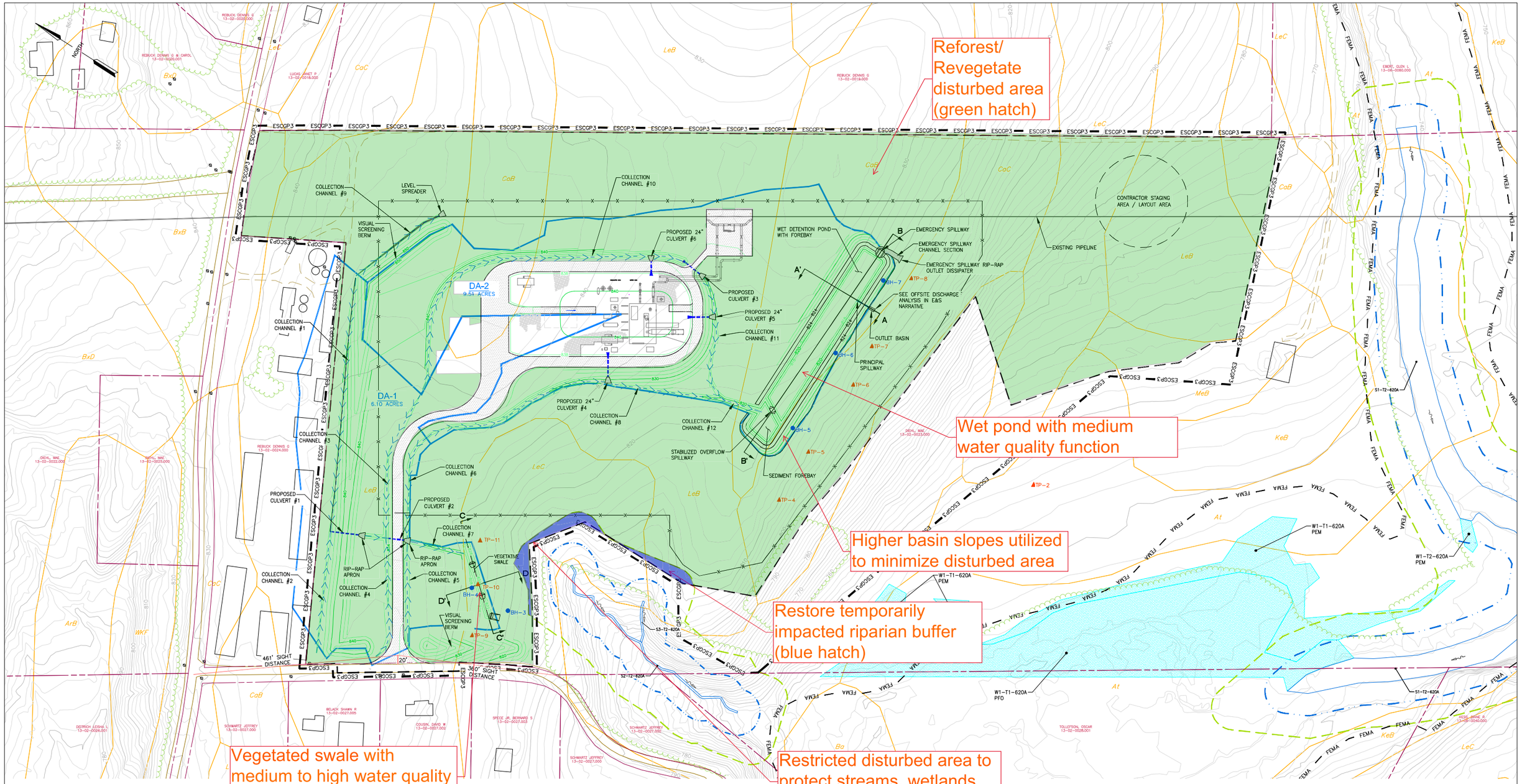
100-yr Primary Outflow Imported from Channels #8-12~Pond 7P.hce

Link 12L: Wet Pond



ATTACHMENT 5

NON-STRUCTURAL AND STRUCTURAL WATER QUALITY BMPS MAP



LEGEND

- PROPERTY LINES
- ESCGP3 — ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50' FLOODWAY
- FEMA — FEMA 100-YEAR FLOODPLAIN
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- 780 — EXISTING MINOR CONTOURS (2' C.I.)
- EXISTING MAJOR CONTOURS (10' C.I.)
- MrB2 — SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPOSED MINOR CONTOUR (2' C.I.)
- 830 — PROPOSED MAJOR CONTOUR (10' C.I.)
- PROPOSED FENCE
- 12" CRUSHED STONE (AASHTO #57)
- 4"-6" CRUSHED STONE (AASHTO #57)
- GRASSED AREA
- TP-C3 — SOIL TEST PIT LOCATION
- BH-7 — BORE HOLE TEST LOCATION
- POST-DEVELOPMENT DRAINAGE AREA

CaB	CAVIN SHALY SILT LOAM, 3 TO 8 PERCENT SLOPES
CaC	CALVIN SHALY SILT LOAM, 8 TO 15 PERCENT SLOPES
LeB	LECK KILL CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
LeC	LECK KILL CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES
MeB	MECKESVILLE LOAM, 3 TO 8 PERCENT SLOPES
WKF	WEIKERT AND KLINESVILLE SHALY SILT LOAMS, STEEP

EXISTING CONDITION NOTES/SOURCES

1. EXISTING ROADWAYS, CONTOURS, PROPERTY LINE, TREE LINE, ETC. OCTOBER 2018 AND JULY 2019.
2. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
3. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
4. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
5. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
6. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
7. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC..

GENERAL NOTE

WHERE THE LIMIT OF DISTURBANCE IS SHOWN IMMEDIATELY ADJACENT AND PARALLEL TO THE ESCGP-3 PERMIT BOUNDARY, THE ESCGP-3 PERMIT BOUNDARY IS EQUAL TO THE LIMIT OF DISTURBANCE.

NOT TO SCALE

WHM consulting, INC. — designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN C. CLARK — ENGINEER — CAT/TI-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	05/04/20	SWH	UPDATED GRADING PLAN AND DETAILS PER PADEP COMMENTS			

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 620
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
PROPOSED CONDITIONS PLAN

HEGINS TOWNSHIP — SCHUYKILL COUNTY — PENNSYLVANIA

Williams.

DRAWN BY: SWH	DATE: 8/05/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	BID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 3 OF 7

ATTACHMENT 6
OFFSITE DISCHARGE REPORT

Transcontinental Gas Pipe Line Company, LLC

Offsite Discharge Report

Leidy South Project – Compressor Station 620

Vegetative Swale Outlet Structure
&
Wet Detention Pond Outlet Structure

May 2020

1.0 Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc., is proposing the Leidy South Project (Project). Compressor Station 620 is proposed as part of the overall Project. Compressor Station 620 will consist of installing one gas turbine-driven compressor unit (31,871 nominal HP at ISO conditions). The new Compressor Station will require Erosion and Sediment (E&S) Control and Post Construction Stormwater Management (PCSM) Best Management Practices (BMP's) to manage stormwater runoff during and after construction.

Transco has developed an Offsite Discharge Report for the discharges associated with the proposed BMP's in response to technical deficiency comments issued by Pennsylvania Department of Environmental Protection (PaDEP) on April 3, 2020. An Offsite Discharge Report is performed to ensure that no offsite erosion will occur downstream of the proposed activities. The analysis conducted for this project followed the sequence outlined in PaDEP's factsheet for offsite discharges (Document #3930-FS-DEP4124).

2.0 Conveyance Best Management Practices

Erosion and Sediment Control and Post Construction Stormwater Management BMP's are proposed to manage stormwater runoff during and after construction. A sediment basin and wet pond and vegetative swale will be installed to convey the net increase in volume between the pre and post development 2-year storm events and mitigate the increase (pre-post development) in peak runoff for the 2-, 10-, 50-, and 100-year storm events. An outlet basin, which flows to an offsite area, is proposed as the discharge structure at the sediment basin/wet pond.

2.1 Sediment Basin / Wet Pond

The sediment basin/wet pond discharges to an existing swale and flows offsite into the adjacent forested area located southeast of the Limits of Disturbance. The stormwater is being discharged as sheet flow and travels along a vegetative flow path until it reaches a UNT to Deep Creek. The flow path is depicted on Attachment A. Soil types and the erodibility factors within the flow path are shown on Table 1.

Table 1 – Soils Mapping within Flow Path	
Soil Mapping Unit	**Soil Erodibility Factor, K_f**
CaB	**K_f = 0.20**
CaC	**K_f = 0.20**
LeB	**K_f = 0.20**
WKF	**K_f = 0.17**

The soil erodibility factors are shown in Table 1. A low K value indicates the soil will not easily erode whereas a high K value means the soil will easily erode. All of the soils in the flow path are considered not easily erodible (0.17 – 0.20). Photos were taken along the flow path of the downstream area to show the vegetative cover.

Photo 1 : Existing Area at Proposed Outlet Basin for Sediment Basin/Wet Pond

Photo 2 : Area Downgradient of the Proposed Outlet Basin for Sediment Basin/Wet Pond

Photo 1 shows the existing condition where the outlet basin for the Sediment Basin / Wet Pond is proposed. The area will be graded to facilitate the installation of the sediment basin/wet pond and revegetated. Photo 2 shows the areas downgradient of the proposed outlet basin, which is over 90% vegetated. In the E&S and PCSM Narrative, site calculations are provided that show the Pre- and Post-Construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed outlet basin are 2.49 feet per second for the for the 25 year, 24-hour storm event.

2.2 Vegetative Swale

The vegetative swale discharges and flows offsite into the adjacent forested area located southwest of the Limits of Disturbance. The stormwater is being discharged as sheet flow and travels along a vegetative flow path until it reaches a UNT to Deep Creek.

The flow path is depicted on Attachment A. Soil types and the erodibility factors within the flow path are shown on Table 2.

Table 2 – Soils Mapping with Flow Path	
Soil Mapping Unit	**Soil Erodibility Factor, K_f**
LeC	**K_f = 0.20**
WKF	**K_f = 0.17**

The soil erodibility factors are shown in Table 1. A low K value indicates the soil will not easily erode whereas a high K value means the soil will easily erode. All of the soils in the flow path are considered not easily erodible (0.17 – 0.20). Photos were taken along the flow path of the downstream area to show the vegetative cover.

Photo 3 : Existing Area at Proposed Outlet Basin for Infiltration Basin

Photo 4 : Area Downgradient of the Proposed Outlet Basin for Infiltration Basin

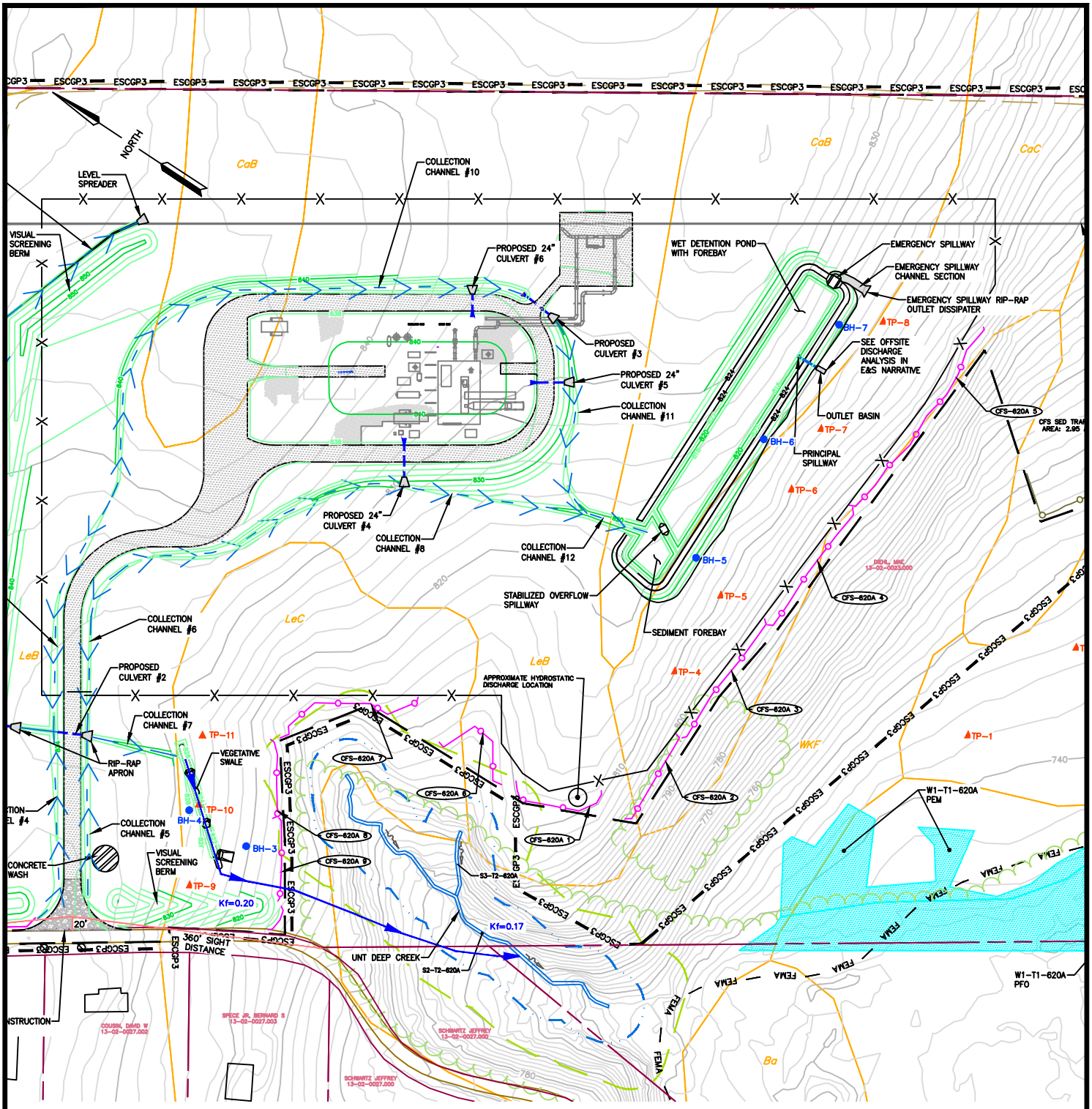
Photo 3 shows the existing condition where the outlet basin for the infiltration basin is proposed. The area will be graded to facilitate the installation of the infiltration basin and revegetated. Photo 4 shows the areas downgradient of the proposed outlet basin for the infiltration basin, which is over 90% vegetated. In the E&S and PCSM Narrative, site calculations are provided that show the Pre- and Post-Construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed outlet basin are 0.35 feet per second for the for the 25 year, 24-hour storm event.

3.0 Conclusion

The Offsite Discharge Report completed for the proposed sediment basin/wet pond and vegetative swale indicated that the flow path downgradient of the outlet basin is not

anticipated to erode during storm events due to the existing vegetative conditions, low discharge velocities, and soil erodibility values.

ATTACHMENT A
OUTLET FLOW PATH MAPS



Williams.

WHM designs, permits, resolutions | consulting, INC.

2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803

TELEPHONE: (814)-689-1650 FAX: (814)-689-1557

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 620

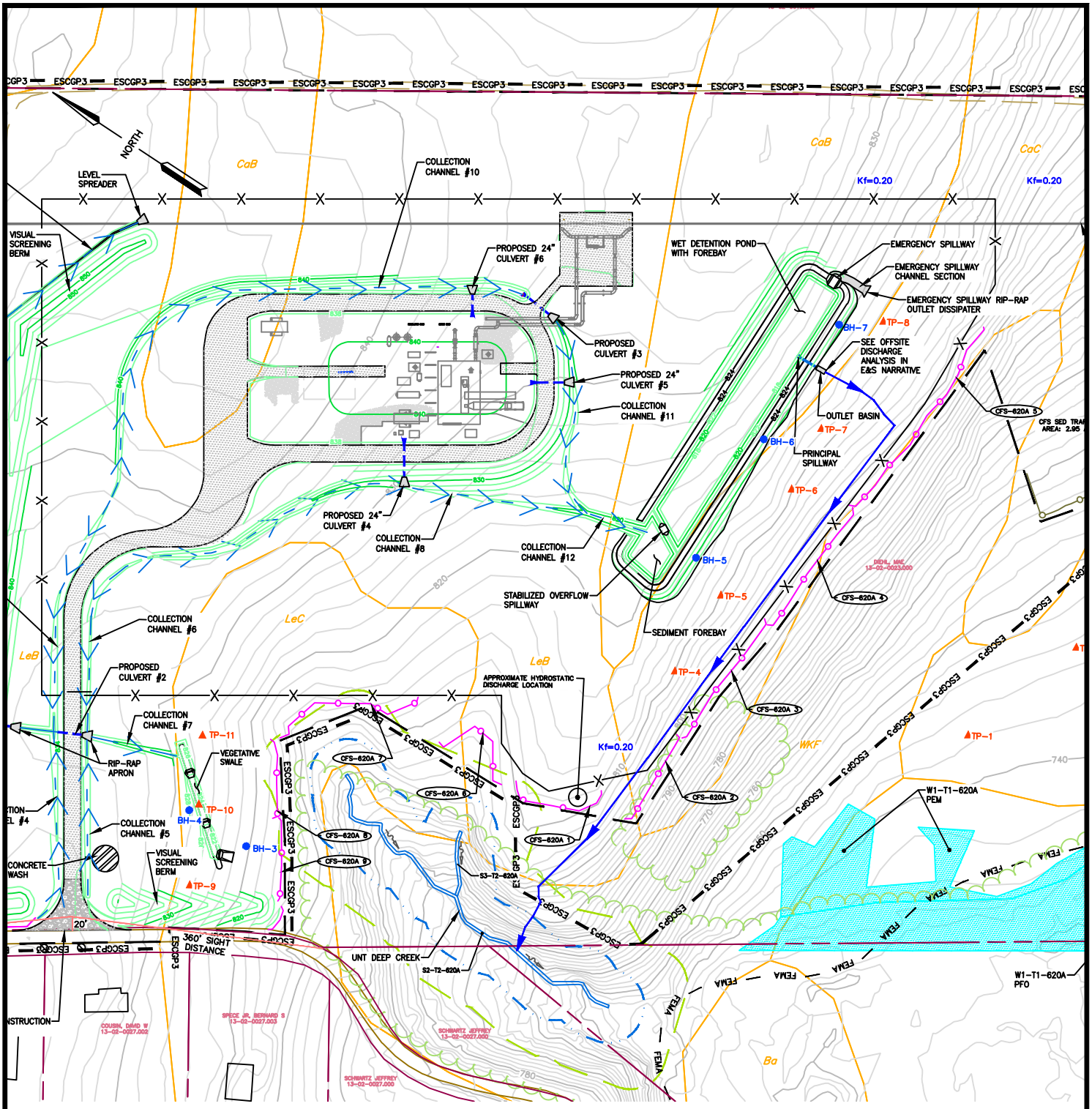
EROSION AND SEDIMENTATION CONTROL PLAN

FLOW PATH

HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

DATE:	05/11/20
DRAWN BY:	RHM
CHECKED:	KCC
WHM DRAWING NO:	VEG SWALE (FLOW PATH)

EXHIBIT 1.0



designs, permits, resolutions | consulting, INC.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - COMPRESSOR STATION 620

EROSION AND SEDIMENTATION CONTROL PLAN

FLOW PATH

HEGINS TOWNSHIP SCHUYKILL COUNTY PENNSYLVANIA

DATE:	05/11/20
DRAWN BY:	RHM
CHECKED:	KCC
WHM DRAWING NO:	BASIN (FLOW PATH)

EXHIBIT 1.0

Transcontinental Gas Pipe Line Company, LLC

Section 3-5 – Act 167 Consistency Verification Report

Leidy South Project

September 2019
(Revised May 2020)

TABLE OF CONTENTS

Sections

1.0 Project Description

2.0 Volume / Rate Control

- 2.1 Hensel Main Line Valve and Access Road – Eastern Terminus *(Revised May 2020)*
- 2.2 Hensel Valve Yard – Western Terminus
- 2.3 Benton Main Line Valve and Access Road – Eastern Terminus *(Revised May 2020)*
- 2.4 Compressor Station 607 *(Revised May 2020)*
- 2.5 Compressor Station 620 *(Revised May 2020)*

3.0 Calculation Methodology

4.0 Summary

1.0 Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. (Williams) proposes an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation that will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco will provide 250,000 dt/day of firm transportation from the Zick Interconnection (located on Central Penn Line North in Susquehanna County, PA) to the River Road Interconnect (located at the interconnection of Central Penn Line South and Transco's mainline in Lancaster County, PA); Transco will lease 330,000 dt/day of capacity from National Fuel Gas Supply Corporation ("NFGSC") from its Clermont Receipt Point in McKean County, PA to Transco's Leidy Hub in Clinton County, PA to provide 330,000 dt/day of firm transportation from the Clermont Receipt Point to the River Road Interconnect. The Project consists of the following primary components:

- Replacement of the capacity of the existing 23.375-inch Leidy Line A with 6.3 miles of 36-inch pipe in Clinton County, Pennsylvania (Hensel Replacement), and related abandonment of 5.8 miles of the existing 23.375-inch Leidy Line A;
- 2.4 miles of 36-inch pipeline loop along Transco's Leidy Line in Clinton County, Pennsylvania (Hilltop Loop);
- 3.5 miles of 42-inch pipeline loop along Transco's Leidy Line in Lycoming County, Pennsylvania (Benton Loop);
- Existing Compressor Station 605 (Wyoming County, Pennsylvania);
- New Compressor Station 607 (Luzerne County, Pennsylvania);
- Existing Compressor Station 610 (Columbia County, Pennsylvania);
- New Compressor Station 620 (Schuylkill County, Pennsylvania);
- Ancillary facilities, such as mainline valves (MLVs), communication facilities, and pig launchers and receivers in Pennsylvania.

Subject to approval and receipt of the necessary permits and authorizations, Transco anticipates that construction of the Project would commence in winter 2020/2021 to meet a target in-service date of December 1, 2021.

Since there will be an increase in the impervious acreage at the site, Transco is required to prepare and implement Post-Construction Stormwater Management (PCSM) Plans. The PCSM Plans must be consistent with any local municipal Act 167 Plan. This report has been prepared to demonstrate consistency of the PCSM Plans with Act 167 Stormwater Management Plans for the individual sites within the project. This report covers the following sites:

1. Hensel Main Line Valve and access road – Eastern Terminus
2. Hensel Main Line Valve - Western Terminus
3. Benton Main Line Valve and access road- Eastern Terminus
4. Compressor Station 607
5. Compressor Station 620

2.0 Volume / Rate Control

2.1 Hensel Main Line Valve and Access Road – Eastern Terminus

Hensel Main Line Valve and access road- Eastern Terminus site is located in the Mudlick Run Watershed, Chapman Township, Clinton County, Pennsylvania, which does not have an Act 167 Stormwater Management Plan in place (source: http://www.clintoncountypa.com/departments/conservation_district/stormwater/index.php). Therefore, it is subject to the requirements of item (g)(2) of PADEP Code Section 102.8, which states that:

> Post-development discharge rates shall not exceed the predevelopment discharge rates for the 1, 2, 5, 10, 25, 50, and 100 year storms. If it is shown that the peak rates of discharge indicated by the post- development analysis are less than or equal to the peak rates of discharge indicated by the predevelopment analysis for 1, 2, 5,10, 25, 50, and 100 year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement. (Source: http://www.stormwaterpa.org/assets/media/regulatory/363-0300-003.pdf)

An analysis of pre- and post-development stormwater runoff was performed for this project. The construction of various impermeable areas will increase the volume of stormwater runoff. Transco will

construct a vegetated swale, an infiltration berm and a soil amendment area to mitigate the increase in volume and peak rates associated with impervious area construction.

The following table shows the net increase in volume between the pre- and post-development 2-year rainfall events.

Pre- and Post-Construction Stormwater Volume for 2-yr Rainfall event

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction with BMPs (cf)	Net (cf)
1,761	4,118	0	-1,761

The following table summarized the pre- and post-construction peak discharges rates for the 1 through 100 year storm events.

Pre- and Post-Construction Peak Discharge Volume

Storm Event	Pre-construction (cfs)	Post-construction before BMPs (cfs)	Post-construction with BMPs (cfs)	Net (cfs)
1-year	0.03	0.36	0.00	-0.03
2-year	0.16	0.98	0.00	-0.16
10-year	1.20	3.33	0.00	-1.20
25-year	2.30	5.23	0.16	-2.14
50-year	3.41	7.05	0.46	-2.95
100-year	4.75	9.12	1.75	-3.00

2.2 Hensel Main Line Valve – Western Terminus

Hensel Main Line Valve near the Western terminus is located in the Kettle Creek Watershed, Leidy Township, Clinton County, Pennsylvania, which does not have an Act 167 Stormwater Management Plan in place (source: http://www.clintoncountypa.com/departments/conservation_district/stormwater/index.php). Therefore, it is subject to the requirements of item (g)(2) of PADEP Code Section 102.8, which states that:

> Post-development discharge rates shall not exceed the predevelopment discharge rates for the 1, 2, 5, 10, 25, 50, and 100 year storms. If it is shown that the peak rates of discharge indicated by the post- development analysis are less than or equal to the peak rates of discharge indicated by the predevelopment analysis for 1, 2, 5,10, 25, 50, and 100 year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement. (Source: http://www.stormwaterpa.org/assets/media/regulatory/363-0300-003.pdf)

An analysis of pre- and post-development stormwater runoff was performed for this project. The construction of various impermeable areas will increase the volume of stormwater runoff. Transco will construct an infiltration berm around a soil amended area to mitigate the increase in volume and peak rates associated with impervious area construction.

The following table shows the net increase in volume between the pre- and post-development 2-year rainfall events.

Pre- and Post-Construction Stormwater Volume

Pre-construction (acre feet)	Post-construction before BMPs (af)	Post-construction with BMPs (af)	Net (af)
5,532	6,229	1,525	-4,007

The following table summarized the pre- and post-construction peak discharges rates for the 1 through 100 year storm events.

Pre- and Post-Construction Peak Discharge Volume

Storm Event	Pre-construction (cfs)	Post-construction before BMPs (cfs)	Post-construction with BMPs (cfs)	Net (cfs)
1-year	0.17	0.42	0.04	-0.13
2-year	1.08	1.77	0.43	-0.66
10-year	5.67	7.36	2.28	-3.39
25-year	9.63	11.97	3.85	-5.78
50-year	13.34	16.35	6.94	-6.40
100-year	17.88	21.44	17.68	-0.20

2.3 Benton Main Line Valve and Access Road – Eastern Terminus

Benton Main Line Valve and access road- Eastern Terminus site is located in the Little Fishing Watershed, Jordan Township, Lycoming County, Pennsylvania. Lycoming County's Act 167 Stormwater Management Plan states that:

1. Determine the pre-development and post-development runoff for the development site based on a 2-, 5-, 10- 25-, 50-, and 100-year storm event (do not include existing or proposed stormwater detention techniques). If the post-development peak runoff rate is less than or equal to the pre-development peak runoff rate, the requirements of this plan and the Act 167 Plan have been met. If the post-development peak runoff rate is greater than the pre-development peak runoff rate then the applicant must proceed to Step 2.

2. Apply site-specific stormwater management techniques to infiltrate, and reduce the amount of impervious surfaces. Determine the new post-development peak runoff rate for

the 2-, 5-, 10- 25-, 50-, and100-year storm events. If the new post-development peak runoff rate is less than or equal to the pre-development peak runoff multiplied by the assigned release rate, the requirements of this plan and the Act 167 Plan have been achieved. If the post-development peak runoff rate is still greater than the pre-development peak runoff rate multiplied by the assigned release rate, then the applicant must proceed to Step 3.

3. Determine the allowable total peak runoff rate from the individual site by multiplying the pre-development peak runoff rate by the assigned release rate. Design detention/retention or other necessary stormwater management techniques in order to meet the allowable peak runoff rate.

The following four (4) design storm events in the following table are percent of existing condition (pre-development) peak stormwater runoff rates:

1-Year	50%
10-Year	50%
25-Year	100%
100-Year	100%

Source:
https://www.lyco.org/Portals/1/PlanningCommunityDevelopment/Documents/EDPS_PDFs/lycoming_county_swp_dep_approved_16sep2010_reduced.pdf

An analysis of pre- and post-development stormwater runoff was performed for this project. The construction of various impermeable areas will increase the volume of stormwater runoff. Transco will utilize a wet pond to mitigate the increase in volume and peak rates associated with impervious area construction.

The following table shows the net increase in volume between the pre- and post-development 2-year rainfall events.

Pre- and Post-Construction Stormwater Volume

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction with BMPs (cf)	Net (cf)
0	0	0	0

The following table summarized the pre- and post-construction peak discharges rates for the 1 through 100 year storm events. The post-development peak runoff rate is less than the pre-development peak runoff rate and hence, the requirements of Lycoming County's Act 167 Plan have been met.

Pre- and Post-Construction Peak Discharge Volume

Storm Event	Pre-construction (cfs)	Post-construction before BMPs (cfs)	Post-construction with BMPs (cfs)	Net (cfs)
1-year	0.00	0.00	0.00	0.00
2-year	0.00	0.00	0.00	0.00
10-year	0.02	0.04	0.01	-0.01
25-year	0.10	0.19	0.06	-0.04
50-year	0.33	0.65	0.19	-0.14
100-year	1.14	1.92	0.61	-0.53

2.4 Compressor Station 607

Compressor Station 607 project is located in Fairmount Township, Luzerne County, Pennsylvania. Luzerne County's Stormwater Management Ordinance (adopted on August 18, 2010) states that:

1. Post-development discharge rates shall not exceed the predevelopment discharge rates for the 1- through 100-year, 24-hour storms. If it is shown that the peak rates of discharge indicated by the post-development analysis are less than or equal to the peak rates of discharge indicated by the predevelopment analysis for 1- through 100-year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.
2. For volume control,
    a. Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year 24-hour duration precipitation.
    b. For modeling purposes:
        - Existing (predevelopment) non-forested pervious areas must be considered meadow or its equivalent.
        - 20% of existing impervious area, when present, shall be considered meadow in the model for existing conditions.

(Source:https://www.luzernecounty.org/DocumentCenter/View/367/Luzerne-County-Stormwater-Management-Ordinance-PDF)

The HydroCAD model has been setup assuming that 20% of existing impervious area is meadow and all existing non-forested pervious areas were considered to be in meadow condition.

An analysis of pre- and post-development stormwater runoff was performed for this project. The construction of various impermeable areas will increase the volume of stormwater runoff. Transco will construct a wet pond and infiltration basin to mitigate the increase in volume and peak rates associated with impervious area construction.

The following table shows the net increase in volume between the pre- and post-development 2-year rainfall events.

Pre- and Post-Construction Stormwater Volume

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction with BMPs (cf)	Net (cf)
52,920	66,782	34,499	-18,421

The following table summarized the pre- and post-construction peak discharges rates for the 1 through 100 year storm events. The post-development peak runoff rate is less than the pre-development peak runoff rate and hence, the requirements of Luzerne County's Act 167 Plan have been met.

Pre- and Post-Construction Peak Discharge Volume

Storm Event	Pre-construction (cfs)	Post-construction before BMPs (cfs)	Post-construction with BMPs (cfs)	Net (cfs)
1-year	6.92	10.90	5.11	-1.81
2-year	11.16	16.24	8.22	-2.94
10-year	24.72	32.56	19.28	-5.44
25-year	35.59	45.18	28.53	-7.06
50-year	45.88	56.91	37.30	-8.58
100-year	58.41	70.90	49.54	-8.87

2.5 Compressor Station 620

Compressor Station 620 project is located in Pine Creek Watershed, Hegins Township, Schuylkill County, Pennsylvania. Schuylkill County has not developed an Act 167 Stormwater Management Plan for Pine Creek Watershed (Source: http://stormwaterpa.org/media/cumberland/act167basemap.pdf). Therefore, it is subject to the requirements of item (g)(2) of PADEP Code Section 102.8, which states that:

> Post-development discharge rates shall not exceed the predevelopment discharge rates for the 1, 2, 5, 10, 25, 50, and 100 year storms. If it is shown that the peak rates of discharge indicated

by the post- development analysis are less than or equal to the peak rates of discharge indicated by the predevelopment analysis for 1, 2, 5,10, 25, 50, and 100 year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement. (Source: http://www.stormwaterpa.org/assets/media/regulatory/363-0300-003.pdf)

An analysis of pre- and post-development stormwater runoff was performed for this project. The construction of various impermeable areas will increase the volume of stormwater runoff. Transco will construct a wet pond and vegetated swale to mitigate the increase in volume and peak rates associated with impervious area construction.

The following table shows the net increase in volume between the pre- and post-development 2-year rainfall events.

Pre- and Post-Construction Stormwater Volume

Pre-construction (cf)	Post-construction before BMPs (cf)	Post-construction with BMPs (cf)	Net (cf)
15,530	31,324	567	-14,963

The following table summarized the pre- and post-construction peak discharges rates for the 1 through 100 year storm events.

Pre- and Post-Construction Peak Discharge Volume

Storm Event	Pre-construction (cfs)	Post-construction before BMPs (cfs)	Post-construction with BMPs (cfs)	Net (cfs)
1-year	0.65	3.13	0.00	-0.65
2-year	2.27	6.56	0.05	-2.22
10-year	10.87	19.69	1.48	-9.39
25-year	19.63	31.39	8.09	-11.54
50-year	28.69	42.98	10.23	-18.46
100-year	41.14	58.81	14.81	-26.33

3.0 Calculation Methodology

The PCSM Plan calculations for this project were prepared using HydroCAD software, which utilized the NRCS Rainfall-Runoff Methods. The 24-hour rainfall totals in Clinton, Lycoming, Luzerne and Schuylkill County from NOAA were used in the stormwater calculations.

4.0 Summary

BAI has reviewed the Act 167 Stormwater Management Plans and has prepared the PCSM plans to be consistent with applicable sections of the Stormwater Management Plans as outlined above.

I do hereby certify that to the best of my knowledge, information, and belief, that the PCSM Plan prepared for the Leidy South Project is consistent with the DEP Approved Act 167 Stormwater Management Plans.

Prepared by: Kevin C. Clark – BAI Group LLC

Signature

Professional Seal

STANDARD PCSM TECHNICAL GUIDE

Hensel Replacement Eastern Terminus Main Line Valve and Access Road

Project: Leidy South Project-Hensel Replacement

Project Name: Hensel Replacement Eastern Terminus Main Line Valve and Access Road Date: 8/22/2019

Check that the following items are completed in the PCSM Plan. If an item is not applicable write N/A.

Item Location: D = E&S Drawings, N = E&S Narrative, D&N = Drawings and Narrative

"The PCSM Plan shall be prepared by a person trained and experienced in PCSM design methods and techniques applicable to the size and scope of the project being designed"

Name Kevin C. Clark Address 2525 Green Tech Drive, Suite D, State College, PA-16803

Telephone No. (814)-238-2060

"The existing topographic features of the project site and the immediate surrounding area"

D	Legible Mapping	D
D	Existing Contours	D
D	Type of Cover	D
D	Existing Improvements (i.e. roads, buildings, utilities, etc.)	D
D	Sufficient surrounding area	D
D	Complete mapping symbols and north arrow	D
D&N	Location Map (i.e. USGS)	D or N

"The types, depth, slope, locations and limitations of the soils and geologic formations"

D&N	Types, slopes and locations of soil types	D
D&N	Soil type use limitations and resolutions	N
D&N	Hydric Soils	N

"The characteristics of the project site, including the past, present and proposed land uses and the proposed alteration to the project site"

D	Proposed limits of construction	D
D	Proposed contours and grades	D
D	Proposed improvements (i.e. roads, buildings, utilities etc.)	D
D&N	Past, present and proposed land uses	N
D	Existing features	D
D	Proposed Impervious Areas	D

"An identification of the net change in volume and rate of stormwater from preconstruction hydrology to post construction hydrology for the entire project site and each drainage area"

N	The design storm used for calculations is identified	N
N	Preconstruction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	Post-construction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	The net change in runoff rate and volume are identified for the entire project site and each drainage area	N

"An identification of the location of surface waters of this Commonwealth, which may receive runoff within or from the project site and their classification under Chapter 93 (relating to water quality standards)"

D	Existing streams, wetlands, floodway, etc.	D
D&N	Receiving watercourses	D

D&N	Chapter 93 classification streams or other water bodies	N

"A written description of the location and type of PCSM BMPs including construction details for permanent stormwater BMPs including permanent stabilization specifications and locations"

D&N	All permanent PCSM BMPs are identified in the narrative and shown in the plan drawings	D & N
D&N	Construction details are included for all permanent PCSM BMPs	N
D&N	Permanent stabilization specifications for all permanent PCSM BMPs are included	N
N/A	Proprietary BMP systems are illustrated on the drawings in accordance with their manufacturer's requirements	D
D&N	Infiltration BMPs are provided with overflows and/or underdrains as needed to meet site and soil limitations	D & N

"A sequence of PCSM BMP implementation or installation in relation to earth disturbance activities of the project site and a schedule of inspections for critical stages of PCSM BMP installation"

D&N	Complete and site specific sequence of BMP installations	D & N
D&N	Activities planned to limit exposed areas	D & N
D&N	Removal of temporary BMPs	D & N
D&N	Critical stages of BMP installation are identified	N

"Supporting calculations"

N	Calculations for all BMPs and points of interest are provided.	N
N	Methodology used for all calculations is identified.	N
N	The design storm used for each calculation is identified.	N
N	Current (2005 or more recent) Act 167 plans are identified	D or N
N	Act 167 plan consistency verification is provided	N
N/A	All flowcharts from the Pennsylvania Stormwater BMP Manual with flow path highlighted have been provided	N
N	All appropriate worksheets from the Pennsylvania Stormwater BMP Manual have been completed and are provided	N

"**Plan drawings"**

D	Locations of BMPs are shown along with tributary drainage areas	D
D&N	Construction details are included for all PCSM BMPs	D
D	All easements and rights-of-way are shown on plan drawings.	D
D	Sensitive resources are shown (i.e. steep slopes, riparian, etc.)	D & N
D	Existing and proposed discharges & points of interest	D
D	Floodplain and floodway delineations	D
D	Locations and sufficient infiltration testing to represent proposed locations of volume and rate control BMPs	D
D	PCSM Plan Drawings are consistent with E&S Plan in relation to proposed contours, improvements, soils, wetlands, floodways, streams, discharge locations, E&S BMPs, etc.	D

Infiltration BMPs

D&N	All infiltration BMPs must have infiltration testing completed	N
N	All infiltration BMPs must have soil testing completed	N
D&N	All infiltration BMPs should be sited on un-compacted soils	D & N

BMP 6.4.2 Infiltration Basins

	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
	Do not install on recently placed fill (<5 years)	D & N
	Allow 2 foot buffer between bed bottom and seasonal high groundwater table	D & N

BMP 6.4.4 Infiltration Trench

_____	Perforated pipe set at a minimum slope in a stone filled, level-bottomed trench	D & N
_____	Limited in width (3 to 8 feet) and depth of stone (6 feet max recommended)	D & N
_____	Trench is wrapped in nonwoven geotextile (top, sides, and bottom)	D & N
_____	A minimum of 6" of topsoil is placed over trench and vegetated	D & N

BMP 6.4.5 Bio-retention

_____	Ponding depths generally limited to 12 inches or less	D & N
_____	Native vegetation that is tolerant of variability, salts and stress	D & N
_____	Modify soil with compost	D & N

BMP 6.4.8 Vegetated swale

D&N _____	Longitudinal slopes range from 1 to 6 %	D & N
D&N _____	Side slopes range from 3:1 to 5:1	D & N
D&N _____	Bottom width of 2 to 8 feet	D & N
D&N _____	Convey the 10-year storm event with a minimum of 6 inches of freeboard	D & N
D&N _____	Designed for non-erosive velocities up to the 10-year storm event	D & N

BMP 6.4.9 Vegetated Filter strip

_____	Filter Strip length is a function of the slope, vegetative cover, and soil type	D & N
_____	Minimum recommended length of filter strip is 25 feet	D & N
_____	Filter strip slope should never exceed 8%; less than 5% are preferred	D & N
_____	Level spreading devices are recommended to provide uniform sheet flow	D & N
_____	Maximum contributing drainage area slope is generally less than 5%	D & N
_____	Minimum filter strip width should equal the width of the drainage area	D & N

BMP 6.4.10 Infiltration Berm

D&N _____	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
D&N _____	Berms should be relatively low, preferable no more than 24 inches in height	D & N
D&N _____	If berms are to be mowed, the berm side slopes should not exceed a ratio of 4:1	D & N
D&N _____	Berms should be vegetated with turf grass at a minimum	D & N

BMP 6.5.2 Runoff recapture and use

_____	Storage devices designed to capture a portion of small, frequent storm events	D & N
_____	Systems must provide for bypass or overflow of large storm events	D & N
_____	Water budget incorporating anticipated water inflow and usage required	D & N

Water Quality and Rate Control BMPs

BMP 6.6.1 Constructed Wetlands

_____	Adequate drainage area or proof of sustained base flow	D & N
_____	Maintenance of permanent water surface	D & N
_____	Relatively impermeable soils or engineered liner	D & N
_____	Sediment collection and removal	D & N
_____	Adjustable permanent pool and dewatering mechanism	D & N

BMP 6.6.2 Wet pond/Retention basin

_____	Adequate drainage area or proof of sustained baseflow	D & N
_____	Natural high groundwater table	D & N
_____	Maintenance of permanent water surface	D & N
_____	Should have at least 2 to 1 length to width ratio	D & N
_____	Forebay for sediment collection and removal	D & N
_____	Dewatering mechanism	D & N

BMP 6.6.3 Dry extended basin

_____	Hydraulic capacity controls effectiveness	D & N
_____	Ideal in combination with other BMPs	D & N

Restoration BMPs

BMP 6.7.1 Riparian buffer restoration

_____	Reestablish buffer areas along perennial, intermittent, and ephemeral streams	D & N
_____	Plant native, diverse tree and shrub vegetation	D & N
_____	Create a short-term maintenance and long-term maintenance plan	D & N
_____	Clear, well-marked boundary	D & N

BMP 6.7.2 Landscape restoration

_____	Minimize traditional turf lawn area	D & N
_____	Maximize landscape restoration area planted with native vegetation	D & N
_____	Protect landscape restoration area during construction	D & N
_____	Prevent post-construction erosion through adequate stabilization	D & N
_____	Minimize mowing (two times per year)	D & N

BMP 6.7.3 Soil amendment and restoration

D&N_____	Physical loosening	D & N
D&N_____	Compost amendments	D & N

BMP 6.7.4 Floodplain restoration

_____	Can prevent riparian problems from getting worse or can fix problems caused by historical practices	D & N
_____	Reattachment of root systems of floodplain vegetation/riparian areas connected to groundwater and/or base flow	D & N
_____	Removal of "legacy sediments" and associated nutrients stored within the stream corridors prior to release through bank erosion	D & N

Other BMPs and related structural measures

BMP 6.8.1 Level spreaders

_____	Must be level	D & N
_____	Are not applicable in areas with easily erodible soils and/or little vegetation	D & N
_____	Should safely diffuse at least the 10-year storm peak rate	D & N
_____	Bypassed flows should be stabilized in a sufficient manner	D & N

"A long-term operation and maintenance schedule, which provides for inspection of PCSM BMPs, including the repair, replacement, or other routine maintenance of the PCSM BMPs to ensure proper function and operation"

D&N_____	Inspection schedule of each permanent BMP is provided	N
D&N_____	Directions for maintenance and/or replacement of each BMP	N
D&N_____	Directions for sediment disposal	N
D&N_____	Responsible party (owner, operator, inspector) has been identified	N

"Procedures which ensure that the proper measures for recycling or disposal of materials associated with or from the PCSM BMPs are in accordance with DEP laws, regulations and requirements"

D&N_____	Project wastes are identified	N
D&N_____	Directions for recycling /disposal of wastes	D or N

"An identification of naturally occurring geologic formations or soil conditions that may provide hazards to the project or surrounding environment or have the potential to cause or contribute to pollution after earth disturbance activities are completed and PCSM BMPs are operational and development of a management plan to avoid or minimize potential pollution and its impacts"

N	Potential for geologic or soil conditions to cause pollution during construction	N
D&N	Instructions for proper handling and/or disposal of all materials which could cause pollution are provided	D
D	Typical details are provided for proper handling and/or disposal of all such materials	D
N/A	The locations of all such materials are clearly shown on the plan maps	D

"An identification of potential thermal impacts from post construction stormwater to surface waters of this Commonwealth including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts"

N	Applicant has described how thermal impacts of stormwater runoff from the project site were avoided	N
D&N	Applicant has described how thermal impacts were minimized and mitigated	D & N

"A riparian forest buffer management plan when required under § 102.14 (relating to riparian buffer requirements)"

D	Existing and/or proposed buffers are shown on the plan drawings	D

STANDARD PCSM TECHNICAL GUIDE

Hensel Replacement Western Terminus Main Line Valve

Project: Leidy South Project-Hensel Replacement

Project Name: Hensel Replacement Western Terminus Main Line Valve Date: 8/22/2019

Check that the following items are completed in the PCSM Plan. If an item is not applicable write N/A.

Item Location: D = E&S Drawings, N = E&S Narrative, D&N = Drawings and Narrative

"The PCSM Plan shall be prepared by a person trained and experienced in PCSM design methods and techniques applicable to the size and scope of the project being designed"

Name Kevin C. Clark Address 2525 Green Tech Drive, Suite D, State College, PA-16803

Telephone No. (814)-238-2060

"The existing topographic features of the project site and the immediate surrounding area"

D	Legible Mapping	D
D	Existing Contours	D
D	Type of Cover	D
D	Existing Improvements (i.e. roads, buildings, utilities, etc.)	D
D	Sufficient surrounding area	D
D	Complete mapping symbols and north arrow	D
D&N	Location Map (i.e. USGS)	D or N

"The types, depth, slope, locations and limitations of the soils and geologic formations"

D&N	Types, slopes and locations of soil types	D
D&N	Soil type use limitations and resolutions	N
D&N	Hydric Soils	N

"The characteristics of the project site, including the past, present and proposed land uses and the proposed alteration to the project site"

D	Proposed limits of construction	D
D	Proposed contours and grades	D
D	Proposed improvements (i.e. roads, buildings, utilities etc.)	D
D&N	Past, present and proposed land uses	N
D	Existing features	D
D	Proposed Impervious Areas	D

"An identification of the net change in volume and rate of stormwater from preconstruction hydrology to post construction hydrology for the entire project site and each drainage area"

N	The design storm used for calculations is identified	N
N	Preconstruction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	Post-construction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	The net change in runoff rate and volume are identified for the entire project site and each drainage area	N

"An identification of the location of surface waters of this Commonwealth, which may receive runoff within or from the project site and their classification under Chapter 93 (relating to water quality standards)"

D	Existing streams, wetlands, floodway, etc.	D
D&N	Receiving watercourses	D

D&N	Chapter 93 classification streams or other water bodies	N

"A written description of the location and type of PCSM BMPs including construction details for permanent stormwater BMPs including permanent stabilization specifications and locations"

D&N	All permanent PCSM BMPs are identified in the narrative and shown in the plan drawings	D & N
D&N	Construction details are included for all permanent PCSM BMPs	N
D&N	Permanent stabilization specifications for all permanent PCSM BMPs are included	N
N/A	Proprietary BMP systems are illustrated on the drawings in accordance with their manufacturer's requirements	D
D&N	Infiltration BMPs are provided with overflows and/or underdrains as needed to meet site and soil limitations	D & N

"A sequence of PCSM BMP implementation or installation in relation to earth disturbance activities of the project site and a schedule of inspections for critical stages of PCSM BMP installation"

D&N	Complete and site specific sequence of BMP installations	D & N
D&N	Activities planned to limit exposed areas	D & N
D&N	Removal of temporary BMPs	D & N
D&N	Critical stages of BMP installation are identified	N

"Supporting calculations"

N	Calculations for all BMPs and points of interest are provided.	N
N	Methodology used for all calculations is identified.	N
N	The design storm used for each calculation is identified.	N
N	Current (2005 or more recent) Act 167 plans are identified	D or N
N	Act 167 plan consistency verification is provided	N
N/A	All flowcharts from the Pennsylvania Stormwater BMP Manual with flow path highlighted have been provided	N
N	All appropriate worksheets from the Pennsylvania Stormwater BMP Manual have been completed and are provided	N

"**Plan drawings"**

D	Locations of BMPs are shown along with tributary drainage areas	D
D&N	Construction details are included for all PCSM BMPs	D
D	All easements and rights-of-way are shown on plan drawings.	D
D	Sensitive resources are shown (i.e. steep slopes, riparian, etc.)	D & N
D	Existing and proposed discharges & points of interest	D
D	Floodplain and floodway delineations	D
D	Locations and sufficient infiltration testing to represent proposed locations of volume and rate control BMPs	D
D	PCSM Plan Drawings are consistent with E&S Plan in relation to proposed contours, improvements, soils, wetlands, floodways, streams, discharge locations, E&S BMPs, etc.	D

Infiltration BMPs

N	All infiltration BMPs must have infiltration testing completed	N
N	All infiltration BMPs must have soil testing completed	N
D&N	All infiltration BMPs should be sited on un-compacted soils	D & N

BMP 6.4.2 Infiltration Basins

	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
	Do not install on recently placed fill (<5 years)	D & N
	Allow 2 foot buffer between bed bottom and seasonal high groundwater table	D & N

BMP 6.4.4 Infiltration Trench

_____	Perforated pipe set at a minimum slope in a stone filled, level-bottomed trench	D & N
_____	Limited in width (3 to 8 feet) and depth of stone (6 feet max recommended)	D & N
_____	Trench is wrapped in nonwoven geotextile (top, sides, and bottom)	D & N
_____	A minimum of 6” of topsoil is placed over trench and vegetated	D & N

BMP 6.4.5 Bio-retention

_____	Ponding depths generally limited to 12 inches or less	D & N
_____	Native vegetation that is tolerant of variability, salts and stress	D & N
_____	Modify soil with compost	D & N

BMP 6.4.8 Vegetated swale

_____	Longitudinal slopes range from 1 to 6 %	D & N
_____	Side slopes range from 3:1 to 5:1	D & N
_____	Bottom width of 2 to 8 feet	D & N
_____	Convey the 10-year storm event with a minimum of 6 inches of freeboard	D & N
_____	Designed for non-erosive velocities up to the 10-year storm event	D & N

BMP 6.4.9 Vegetated Filter strip

_____	Filter Strip length is a function of the slope, vegetative cover, and soil type	D & N
_____	Minimum recommended length of filter strip is 25 feet	D & N
_____	Filter strip slope should never exceed 8%; less than 5% are preferred	D & N
_____	Level spreading devices are recommended to provide uniform sheet flow	D & N
_____	Maximum contributing drainage area slope is generally less than 5%	D & N
_____	Minimum filter strip width should equal the width of the drainage area	D & N

BMP 6.4.10 Infiltration Berm

D&N	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
D&N	Berms should be relatively low, preferable no more than 24 inches in height	D & N
D&N	If berms are to be mowed, the berm side slopes should not exceed a ratio of 4:1	D & N
D&N	Berms should be vegetated with turf grass at a minimum	D & N

BMP 6.5.2 Runoff recapture and use

_____	Storage devices designed to capture a portion of small, frequent storm events	D & N
_____	Systems must provide for bypass or overflow of large storm events	D & N
_____	Water budget incorporating anticipated water inflow and usage required	D & N

Water Quality and Rate Control BMPs

BMP 6.6.1 Constructed Wetlands

_____	Adequate drainage area or proof of sustained base flow	D & N
_____	Maintenance of permanent water surface	D & N
_____	Relatively impermeable soils or engineered liner	D & N
_____	Sediment collection and removal	D & N
_____	Adjustable permanent pool and dewatering mechanism	D & N

BMP 6.6.2 Wet pond/Retention basin

_____	Adequate drainage area or proof of sustained baseflow	D & N
_____	Natural high groundwater table	D & N
_____	Maintenance of permanent water surface	D & N
_____	Should have at least 2 to 1 length to width ratio	D & N
_____	Forebay for sediment collection and removal	D & N
_____	Dewatering mechanism	D & N

BMP 6.6.3 Dry extended basin

_____	Hydraulic capacity controls effectiveness	D & N
_____	Ideal in combination with other BMPs	D & N

Restoration BMPs

BMP 6.7.1 Riparian buffer restoration

_____	Reestablish buffer areas along perennial, intermittent, and ephemeral streams	D & N
_____	Plant native, diverse tree and shrub vegetation	D & N
_____	Create a short-term maintenance and long-term maintenance plan	D & N
_____	Clear, well-marked boundary	D & N

BMP 6.7.2 Landscape restoration

_____	Minimize traditional turf lawn area	D & N
_____	Maximize landscape restoration area planted with native vegetation	D & N
_____	Protect landscape restoration area during construction	D & N
_____	Prevent post-construction erosion through adequate stabilization	D & N
_____	Minimize mowing (two times per year)	D & N

BMP 6.7.3 Soil amendment and restoration

D&N_____	Physical loosening	D & N
D&N_____	Compost amendments	D & N

BMP 6.7.4 Floodplain restoration

_____	Can prevent riparian problems from getting worse or can fix problems caused by historical practices	D & N
_____	Reattachment of root systems of floodplain vegetation/riparian areas connected to groundwater and/or base flow	D & N
_____	Removal of "legacy sediments" and associated nutrients stored within the stream corridors prior to release through bank erosion	D & N

Other BMPs and related structural measures

BMP 6.8.1 Level spreaders

_____	Must be level	D & N
_____	Are not applicable in areas with easily erodible soils and/or little vegetation	D & N
_____	Should safely diffuse at least the 10-year storm peak rate	D & N
_____	Bypassed flows should be stabilized in a sufficient manner	D & N

"A long-term operation and maintenance schedule, which provides for inspection of PCSM BMPs, including the repair, replacement, or other routine maintenance of the PCSM BMPs to ensure proper function and operation"

D&N_____	Inspection schedule of each permanent BMP is provided	N
D&N_____	Directions for maintenance and/or replacement of each BMP	N
D&N_____	Directions for sediment disposal	N
D&N_____	Responsible party (owner, operator, inspector) has been identified	N

"Procedures which ensure that the proper measures for recycling or disposal of materials associated with or from the PCSM BMPs are in accordance with DEP laws, regulations and requirements"

D&N_____	Project wastes are identified	N
D&N_____	Directions for recycling /disposal of wastes	D or N

"An identification of naturally occurring geologic formations or soil conditions that may provide hazards to the project or surrounding environment or have the potential to cause or contribute to pollution after earth disturbance activities are completed and PCSM BMPs are operational and development of a management plan to avoid or minimize potential pollution and its impacts"

N	Potential for geologic or soil conditions to cause pollution during construction	N
D&N	Instructions for proper handling and/or disposal of all materials which could cause pollution are provided	D
D	Typical details are provided for proper handling and/or disposal of all such materials	D
N/A	The locations of all such materials are clearly shown on the plan maps	D

"An identification of potential thermal impacts from post construction stormwater to surface waters of this Commonwealth including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts"

N	Applicant has described how thermal impacts of stormwater runoff from the project site were avoided	N
D&N	Applicant has described how thermal impacts were minimized and mitigated	D & N

"A riparian forest buffer management plan when required under § 102.14 (relating to riparian buffer requirements)"

D	Existing and/or proposed buffers are shown on the plan drawings	D

STANDARD PCSM TECHNICAL GUIDE

Benton Loop Eastern Terminus Main Line Valve and Access Road

Project: Leidy South Project-Benton Loop

Project Name: Benton Loop Eastern Terminus Main Line Valve Date: 8/22/2019

Check that the following items are completed in the PCSM Plan. If an item is not applicable write N/A.

Item Location: D = E&S Drawings, N = E&S Narrative, D&N = Drawings and Narrative

"The PCSM Plan shall be prepared by a person trained and experienced in PCSM design methods and techniques applicable to the size and scope of the project being designed"

Name Kevin C. Clark Address 2525 Green Tech Drive, Suite D, State College, PA-16803

Telephone No. (814)-238-2060

"The existing topographic features of the project site and the immediate surrounding area"

D	Legible Mapping	D
D	Existing Contours	D
D	Type of Cover	D
D	Existing Improvements (i.e. roads, buildings, utilities, etc.)	D
D	Sufficient surrounding area	D
D	Complete mapping symbols and north arrow	D
D&N	Location Map (i.e. USGS)	D or N

"The types, depth, slope, locations and limitations of the soils and geologic formations"

D&N	Types, slopes and locations of soil types	D
D&N	Soil type use limitations and resolutions	N
D&N	Hydric Soils	N

"The characteristics of the project site, including the past, present and proposed land uses and the proposed alteration to the project site"

D	Proposed limits of construction	D
D	Proposed contours and grades	D
D	Proposed improvements (i.e. roads, buildings, utilities etc.)	D
D&N	Past, present and proposed land uses	N
D	Existing features	D
D	Proposed Impervious Areas	D

"An identification of the net change in volume and rate of stormwater from preconstruction hydrology to post construction hydrology for the entire project site and each drainage area"

N	The design storm used for calculations is identified	N
N	Preconstruction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	Post-construction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	The net change in runoff rate and volume are identified for the entire project site and each drainage area	N

"An identification of the location of surface waters of this Commonwealth, which may receive runoff within or from the project site and their classification under Chapter 93 (relating to water quality standards)"

D	Existing streams, wetlands, floodway, etc.	D
D&N	Receiving watercourses	D
D&N	Chapter 93 classification streams or other water bodies	N

"A written description of the location and type of PCSM BMPs including construction details for permanent stormwater BMPs including permanent stabilization specifications and locations"

D&N	All permanent PCSM BMPs are identified in the narrative and shown in the plan drawings	D & N
D&N	Construction details are included for all permanent PCSM BMPs	N
D&N	Permanent stabilization specifications for all permanent PCSM BMPs are included	N
N/A	Proprietary BMP systems are illustrated on the drawings in accordance with their manufacturer's requirements	D
D&N	Infiltration BMPs are provided with overflows and/or underdrains as needed to meet site and soil limitations	D & N

"A sequence of PCSM BMP implementation or installation in relation to earth disturbance activities of the project site and a schedule of inspections for critical stages of PCSM BMP installation"

D&N	Complete and site specific sequence of BMP installations	D & N
D&N	Activities planned to limit exposed areas	D & N
D&N	Removal of temporary BMPs	D & N
D&N	Critical stages of BMP installation are identified	N

"Supporting calculations"

N	Calculations for all BMPs and points of interest are provided.	N
N	Methodology used for all calculations is identified.	N
N	The design storm used for each calculation is identified.	N
N	Current (2005 or more recent) Act 167 plans are identified	D or N
N	Act 167 plan consistency verification is provided	N
N/A	All flowcharts from the Pennsylvania Stormwater BMP Manual with flow path highlighted have been provided	N
N	All appropriate worksheets from the Pennsylvania Stormwater BMP Manual have been completed and are provided	N

"**Plan drawings"**

D	Locations of BMPs are shown along with tributary drainage areas	D
D&N	Construction details are included for all PCSM BMPs	D
D	All easements and rights-of-way are shown on plan drawings.	D
D	Sensitive resources are shown (i.e. steep slopes, riparian, etc.)	D & N
D	Existing and proposed discharges & points of interest	D
D	Floodplain and floodway delineations	D
D	Locations and sufficient infiltration testing to represent proposed locations of volume and rate control BMPs	D
D	PCSM Plan Drawings are consistent with E&S Plan in relation to proposed contours, improvements, soils, wetlands, floodways, streams, discharge locations, E&S BMPs, etc.	D

Infiltration BMPs

	All infiltration BMPs must have infiltration testing completed	N
	All infiltration BMPs must have soil testing completed	N
	All infiltration BMPs should be sited on un-compacted soils	D & N

BMP 6.4.2 Infiltration Basins

	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
	Do not install on recently placed fill (<5 years)	D & N
	Allow 2 foot buffer between bed bottom and seasonal high groundwater table	D & N

BMP 6.4.4 Infiltration Trench

_____	Perforated pipe set at a minimum slope in a stone filled, level-bottomed trench	D & N
_____	Limited in width (3 to 8 feet) and depth of stone (6 feet max recommended)	D & N
_____	Trench is wrapped in nonwoven geotextile (top, sides, and bottom)	D & N
_____	A minimum of 6" of topsoil is placed over trench and vegetated	D & N

BMP 6.4.5 Bio-retention

_____	Ponding depths generally limited to 12 inches or less	D & N
_____	Native vegetation that is tolerant of variability, salts and stress	D & N
_____	Modify soil with compost	D & N

BMP 6.4.8 Vegetated swale

_____	Longitudinal slopes range from 1 to 6 %	D & N
_____	Side slopes range from 3:1 to 5:1	D & N
_____	Bottom width of 2 to 8 feet	D & N
_____	Convey the 10-year storm event with a minimum of 6 inches of freeboard	D & N
_____	Designed for non-erosive velocities up to the 10-year storm event	D & N

BMP 6.4.9 Vegetated Filter strip

_____	Filter Strip length is a function of the slope, vegetative cover, and soil type	D & N
_____	Minimum recommended length of filter strip is 25 feet	D & N
_____	Filter strip slope should never exceed 8%; less than 5% are preferred	D & N
_____	Level spreading devices are recommended to provide uniform sheet flow	D & N
_____	Maximum contributing drainage area slope is generally less than 5%	D & N
_____	Minimum filter strip width should equal the width of the drainage area	D & N

BMP 6.4.10 Infiltration Berm

_____	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
_____	Berms should be relatively low, preferable no more than 24 inches in height	D & N
_____	If berms are to be mowed, the berm side slopes should not exceed a ratio of 4:1	D & N
_____	Berms should be vegetated with turf grass at a minimum	D & N

BMP 6.5.2 Runoff recapture and use

_____	Storage devices designed to capture a portion of small, frequent storm events	D & N
_____	Systems must provide for bypass or overflow of large storm events	D & N
_____	Water budget incorporating anticipated water inflow and usage required	D & N

Water Quality and Rate Control BMPs

BMP 6.6.1 Constructed Wetlands

_____	Adequate drainage area or proof of sustained base flow	D & N
_____	Maintenance of permanent water surface	D & N
_____	Relatively impermeable soils or engineered liner	D & N
_____	Sediment collection and removal	D & N
_____	Adjustable permanent pool and dewatering mechanism	D & N

BMP 6.6.2 Wet pond/Retention basin

D&N _____	Adequate drainage area or proof of sustained baseflow	D & N
D&N _____	Natural high groundwater table	D & N
D&N _____	Maintenance of permanent water surface	D & N
D&N _____	Should have at least 2 to 1 length to width ratio	D & N
D&N _____	Forebay for sediment collection and removal	D & N
D&N _____	Dewatering mechanism	D & N

BMP 6.6.3 Dry extended basin

_____	Hydraulic capacity controls effectiveness	D & N
_____	Ideal in combination with other BMPs	D & N

Restoration BMPs

BMP 6.7.1 Riparian buffer restoration

_____	Reestablish buffer areas along perennial, intermittent, and ephemeral streams	D & N
_____	Plant native, diverse tree and shrub vegetation	D & N
_____	Create a short-term maintenance and long-term maintenance plan	D & N
_____	Clear, well-marked boundary	D & N

BMP 6.7.2 Landscape restoration

_____	Minimize traditional turf lawn area	D & N
_____	Maximize landscape restoration area planted with native vegetation	D & N
_____	Protect landscape restoration area during construction	D & N
_____	Prevent post-construction erosion through adequate stabilization	D & N
_____	Minimize mowing (two times per year)	D & N

BMP 6.7.3 Soil amendment and restoration

_____	Physical loosening	D & N
_____	Compost amendments	D & N

BMP 6.7.4 Floodplain restoration

_____	Can prevent riparian problems from getting worse or can fix problems caused by historical practices	D & N
_____	Reattachment of root systems of floodplain vegetation/riparian areas connected to groundwater and/or base flow	D & N
_____	Removal of "legacy sediments" and associated nutrients stored within the stream corridors prior to release through bank erosion	D & N

Other BMPs and related structural measures

BMP 6.8.1 Level spreaders

_____	Must be level	D & N
_____	Are not applicable in areas with easily erodible soils and/or little vegetation	D & N
_____	Should safely diffuse at least the 10-year storm peak rate	D & N
_____	Bypassed flows should be stabilized in a sufficient manner	D & N

"A long-term operation and maintenance schedule, which provides for inspection of PCSM BMPs, including the repair, replacement, or other routine maintenance of the PCSM BMPs to ensure proper function and operation"

D&N _____	Inspection schedule of each permanent BMP is provided	N
D&N _____	Directions for maintenance and/or replacement of each BMP	N
D&N _____	Directions for sediment disposal	N
D&N _____	Responsible party (owner, operator, inspector) has been identified	N

"Procedures which ensure that the proper measures for recycling or disposal of materials associated with or from the PCSM BMPs are in accordance with DEP laws, regulations and requirements"

D&N _____	Project wastes are identified	N
D&N _____	Directions for recycling /disposal of wastes	D or N

"An identification of naturally occurring geologic formations or soil conditions that may provide hazards to the project or surrounding environment or have the potential to cause or contribute to pollution after earth disturbance activities are completed and PCSM BMPs are operational and development of a management plan to avoid or minimize potential pollution and its impacts"

N	Potential for geologic or soil conditions to cause pollution during construction	N
D&N	Instructions for proper handling and/or disposal of all materials which could cause pollution are provided	D
D	Typical details are provided for proper handling and/or disposal of all such materials	D
N/A	The locations of all such materials are clearly shown on the plan maps	D

"An identification of potential thermal impacts from post construction stormwater to surface waters of this Commonwealth including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts"

N	Applicant has described how thermal impacts of stormwater runoff from the project site were avoided	N
D&N	Applicant has described how thermal impacts were minimized and mitigated	D & N

"A riparian forest buffer management plan when required under § 102.14 (relating to riparian buffer requirements)"

D	Existing and/or proposed buffers are shown on the plan drawings	D

STANDARD PCSM TECHNICAL GUIDE

Compressor Station 607

Project: Leidy South Project-Compressor Station 607

Project Name: Compressor Station 607 Date: 8/22/2019

Check that the following items are completed in the PCSM Plan. If an item is not applicable write N/A.

Item Location: D = E&S Drawings, N = E&S Narrative, D&N = Drawings and Narrative

"The PCSM Plan shall be prepared by a person trained and experienced in PCSM design methods and techniques applicable to the size and scope of the project being designed"

Name Kevin C. Clark Address 2525 Green Tech Drive, Suite D, State College, PA-16803

Telephone No. (814)-238-2060

"The existing topographic features of the project site and the immediate surrounding area"

D	Legible Mapping	D
D	Existing Contours	D
D	Type of Cover	D
D	Existing Improvements (i.e. roads, buildings, utilities, etc.)	D
D	Sufficient surrounding area	D
D	Complete mapping symbols and north arrow	D
D&N	Location Map (i.e. USGS)	D or N

"The types, depth, slope, locations and limitations of the soils and geologic formations"

D&N	Types, slopes and locations of soil types	D
D&N	Soil type use limitations and resolutions	N
D&N	Hydric Soils	N

"The characteristics of the project site, including the past, present and proposed land uses and the proposed alteration to the project site"

D	Proposed limits of construction	D
D	Proposed contours and grades	D
D	Proposed improvements (i.e. roads, buildings, utilities etc.)	D
D&N	Past, present and proposed land uses	N
D	Existing features	D
D	Proposed Impervious Areas	D

"An identification of the net change in volume and rate of stormwater from preconstruction hydrology to post construction hydrology for the entire project site and each drainage area"

N	The design storm used for calculations is identified	N
N	Preconstruction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	Post-construction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	The net change in runoff rate and volume are identified for the entire project site and each drainage area	N

"An identification of the location of surface waters of this Commonwealth, which may receive runoff within or from the project site and their classification under Chapter 93 (relating to water quality standards)"

D	Existing streams, wetlands, floodway, etc.	D
D&N	Receiving watercourses	D
D&N	Chapter 93 classification streams or other water bodies	N

"A written description of the location and type of PCSM BMPs including construction details for permanent stormwater BMPs including permanent stabilization specifications and locations"

D&N	All permanent PCSM BMPs are identified in the narrative and shown in the plan drawings	D & N
D&N	Construction details are included for all permanent PCSM BMPs	N
D&N	Permanent stabilization specifications for all permanent PCSM BMPs are included	N
N/A	Proprietary BMP systems are illustrated on the drawings in accordance with their manufacturer's requirements	D
D&N	Infiltration BMPs are provided with overflows and/or underdrains as needed to meet site and soil limitations	D & N

"A sequence of PCSM BMP implementation or installation in relation to earth disturbance activities of the project site and a schedule of inspections for critical stages of PCSM BMP installation"

D&N	Complete and site specific sequence of BMP installations	D & N
D&N	Activities planned to limit exposed areas	D & N
D&N	Removal of temporary BMPs	D & N
D&N	Critical stages of BMP installation are identified	N

"Supporting calculations"

N	Calculations for all BMPs and points of interest are provided.	N
N	Methodology used for all calculations is identified.	N
N	The design storm used for each calculation is identified.	N
N	Current (2005 or more recent) Act 167 plans are identified	D or N
N	Act 167 plan consistency verification is provided	N
N/A	All flowcharts from the Pennsylvania Stormwater BMP Manual with flow path highlighted have been provided	N
N	All appropriate worksheets from the Pennsylvania Stormwater BMP Manual have been completed and are provided	N

"**Plan drawings"**

D	Locations of BMPs are shown along with tributary drainage areas	D
D&N	Construction details are included for all PCSM BMPs	D
D	All easements and rights-of-way are shown on plan drawings.	D
D	Sensitive resources are shown (i.e. steep slopes, riparian, etc.)	D & N
D	Existing and proposed discharges & points of interest	D
D	Floodplain and floodway delineations	D
D	Locations and sufficient infiltration testing to represent proposed locations of volume and rate control BMPs	D
D	PCSM Plan Drawings are consistent with E&S Plan in relation to proposed contours, improvements, soils, wetlands, floodways, streams, discharge locations, E&S BMPs, etc.	D

Infiltration BMPs

D&N	All infiltration BMPs must have infiltration testing completed	N
D&N	All infiltration BMPs must have soil testing completed	N
D&N	All infiltration BMPs should be sited on un-compacted soils	D & N

BMP 6.4.2 Infiltration Basins

D&N	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
D&N	Do not install on recently placed fill (<5 years)	D & N
D&N	Allow 2 foot buffer between bed bottom and seasonal high groundwater table	D & N

BMP 6.4.4 Infiltration Trench

_____	Perforated pipe set at a minimum slope in a stone filled, level-bottomed trench	D & N
_____	Limited in width (3 to 8 feet) and depth of stone (6 feet max recommended)	D & N
_____	Trench is wrapped in nonwoven geotextile (top, sides, and bottom)	D & N
_____	A minimum of 6" of topsoil is placed over trench and vegetated	D & N

BMP 6.4.5 Bio-retention

_____	Ponding depths generally limited to 12 inches or less	D & N
_____	Native vegetation that is tolerant of variability, salts and stress	D & N
_____	Modify soil with compost	D & N

BMP 6.4.8 Vegetated swale

_____	Longitudinal slopes range from 1 to 6 %	D & N
_____	Side slopes range from 3:1 to 5:1	D & N
_____	Bottom width of 2 to 8 feet	D & N
_____	Convey the 10-year storm event with a minimum of 6 inches of freeboard	D & N
_____	Designed for non-erosive velocities up to the 10-year storm event	D & N

BMP 6.4.9 Vegetated Filter strip

_____	Filter Strip length is a function of the slope, vegetative cover, and soil type	D & N
_____	Minimum recommended length of filter strip is 25 feet	D & N
_____	Filter strip slope should never exceed 8%; less than 5% are preferred	D & N
_____	Level spreading devices are recommended to provide uniform sheet flow	D & N
_____	Maximum contributing drainage area slope is generally less than 5%	D & N
_____	Minimum filter strip width should equal the width of the drainage area	D & N

BMP 6.4.10 Infiltration Berm

_____	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
_____	Berms should be relatively low, preferable no more than 24 inches in height	D & N
_____	If berms are to be mowed, the berm side slopes should not exceed a ratio of 4:1	D & N
_____	Berms should be vegetated with turf grass at a minimum	D & N

BMP 6.5.2 Runoff recapture and use

_____	Storage devices designed to capture a portion of small, frequent storm events	D & N
_____	Systems must provide for bypass or overflow of large storm events	D & N
_____	Water budget incorporating anticipated water inflow and usage required	D & N

Water Quality and Rate Control BMPs

BMP 6.6.1 Constructed Wetlands

_____	Adequate drainage area or proof of sustained base flow	D & N
_____	Maintenance of permanent water surface	D & N
_____	Relatively impermeable soils or engineered liner	D & N
_____	Sediment collection and removal	D & N
_____	Adjustable permanent pool and dewatering mechanism	D & N

BMP 6.6.2 Wet pond/Retention basin

D&N _____	Adequate drainage area or proof of sustained baseflow	D & N
D&N _____	Natural high groundwater table	D & N
D&N _____	Maintenance of permanent water surface	D & N
D&N _____	Should have at least 2 to 1 length to width ratio	D & N
D&N _____	Forebay for sediment collection and removal	D & N
D&N _____	Dewatering mechanism	D & N

BMP 6.6.3 Dry extended basin

_____	Hydraulic capacity controls effectiveness	D & N
_____	Ideal in combination with other BMPs	D & N

Restoration BMPs

BMP 6.7.1 Riparian buffer restoration

D&N _____	Reestablish buffer areas along perennial, intermittent, and ephemeral streams	D & N
D&N _____	Plant native, diverse tree and shrub vegetation	D & N
D&N _____	Create a short-term maintenance and long-term maintenance plan	D & N
D&N _____	Clear, well-marked boundary	D & N

BMP 6.7.2 Landscape restoration

_____	Minimize traditional turf lawn area	D & N
_____	Maximize landscape restoration area planted with native vegetation	D & N
_____	Protect landscape restoration area during construction	D & N
_____	Prevent post-construction erosion through adequate stabilization	D & N
_____	Minimize mowing (two times per year)	D & N

BMP 6.7.3 Soil amendment and restoration

_____	Physical loosening	D & N
_____	Compost amendments	D & N

BMP 6.7.4 Floodplain restoration

_____	Can prevent riparian problems from getting worse or can fix problems caused by historical practices	D & N
_____	Reattachment of root systems of floodplain vegetation/riparian areas connected to groundwater and/or base flow	D & N
_____	Removal of "legacy sediments" and associated nutrients stored within the stream corridors prior to release through bank erosion	D & N

Other BMPs and related structural measures

BMP 6.8.1 Level spreaders

_____	Must be level	D & N
_____	Are not applicable in areas with easily erodible soils and/or little vegetation	D & N
_____	Should safely diffuse at least the 10-year storm peak rate	D & N
_____	Bypassed flows should be stabilized in a sufficient manner	D & N

"A long-term operation and maintenance schedule, which provides for inspection of PCSM BMPs, including the repair, replacement, or other routine maintenance of the PCSM BMPs to ensure proper function and operation"

D&N _____	Inspection schedule of each permanent BMP is provided	N
D&N _____	Directions for maintenance and/or replacement of each BMP	N
D&N _____	Directions for sediment disposal	N
D&N _____	Responsible party (owner, operator, inspector) has been identified	N

"Procedures which ensure that the proper measures for recycling or disposal of materials associated with or from the PCSM BMPs are in accordance with DEP laws, regulations and requirements"

D&N _____	Project wastes are identified	N
D&N _____	Directions for recycling /disposal of wastes	D or N

"An identification of naturally occurring geologic formations or soil conditions that may provide hazards to the project or surrounding environment or have the potential to cause or contribute to pollution after earth disturbance activities are completed and PCSM BMPs are operational and development of a management plan to avoid or minimize potential pollution and its impacts"

N	Potential for geologic or soil conditions to cause pollution during construction	N
D&N	Instructions for proper handling and/or disposal of all materials which could cause pollution are provided	D
D	Typical details are provided for proper handling and/or disposal of all such materials	D
N/A	The locations of all such materials are clearly shown on the plan maps	D

"An identification of potential thermal impacts from post construction stormwater to surface waters of this Commonwealth including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts"

N	Applicant has described how thermal impacts of stormwater runoff from the project site were avoided	N
D&N	Applicant has described how thermal impacts were minimized and mitigated	D & N

"A riparian forest buffer management plan when required under § 102.14 (relating to riparian buffer requirements)"

D	Existing and/or proposed buffers are shown on the plan drawings	D

STANDARD PCSM TECHNICAL GUIDE

Compressor Station 620

Project: Leidy South Project-Compressor Station 620

Project Name: Compressor Station 620 Date: 6/25/2019

Check that the following items are completed in the PCSM Plan. If an item is not applicable write N/A.

Item Location: D = E&S Drawings, N = E&S Narrative, D&N = Drawings and Narrative

"The PCSM Plan shall be prepared by a person trained and experienced in PCSM design methods and techniques applicable to the size and scope of the project being designed"

Name Kevin C. Clark Address 2525 Green Tech Drive, Suite D, State College, PA-16803

Telephone No. (814)-238-2060

"The existing topographic features of the project site and the immediate surrounding area"

D	Legible Mapping	D
D	Existing Contours	D
D	Type of Cover	D
D	Existing Improvements (i.e. roads, buildings, utilities, etc.)	D
D	Sufficient surrounding area	D
D	Complete mapping symbols and north arrow	D
D&N	Location Map (i.e. USGS)	D or N

"The types, depth, slope, locations and limitations of the soils and geologic formations"

D&N	Types, slopes and locations of soil types	D
D&N	Soil type use limitations and resolutions	N
D&N	Hydric Soils	N

"The characteristics of the project site, including the past, present and proposed land uses and the proposed alteration to the project site"

D	Proposed limits of construction	D
D	Proposed contours and grades	D
D	Proposed improvements (i.e. roads, buildings, utilities etc.)	D
D&N	Past, present and proposed land uses	N
D	Existing features	D
D	Proposed Impervious Areas	D

"An identification of the net change in volume and rate of stormwater from preconstruction hydrology to post construction hydrology for the entire project site and each drainage area"

N	The design storm used for calculations is identified	N
N	Preconstruction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	Post-construction hydrology runoff rate and volume are identified for the entire project site and each drainage area	N
N	The net change in runoff rate and volume are identified for the entire project site and each drainage area	N

"An identification of the location of surface waters of this Commonwealth, which may receive runoff within or from the project site and their classification under Chapter 93 (relating to water quality standards)"

D	Existing streams, wetlands, floodway, etc.	D
D&N	Receiving watercourses	D
D&N	Chapter 93 classification streams or other water bodies	N

"A written description of the location and type of PCSM BMPs including construction details for permanent stormwater BMPs including permanent stabilization specifications and locations"

D&N	All permanent PCSM BMPs are identified in the narrative and shown in the plan drawings	D & N
D&N	Construction details are included for all permanent PCSM BMPs	N
D&N	Permanent stabilization specifications for all permanent PCSM BMPs are included	N
N/A	Proprietary BMP systems are illustrated on the drawings in accordance with their manufacturer's requirements	D
D&N	Infiltration BMPs are provided with overflows and/or underdrains as needed to meet site and soil limitations	D & N

"A sequence of PCSM BMP implementation or installation in relation to earth disturbance activities of the project site and a schedule of inspections for critical stages of PCSM BMP installation"

D&N	Complete and site specific sequence of BMP installations	D & N
D&N	Activities planned to limit exposed areas	D & N
D&N	Removal of temporary BMPs	D & N
D&N	Critical stages of BMP installation are identified	N

"Supporting calculations"

N	Calculations for all BMPs and points of interest are provided.	N
N	Methodology used for all calculations is identified.	N
N	The design storm used for each calculation is identified.	N
N	Current (2005 or more recent) Act 167 plans are identified	D or N
N	Act 167 plan consistency verification is provided	N
N/A	All flowcharts from the Pennsylvania Stormwater BMP Manual with flow path highlighted have been provided	N
N	All appropriate worksheets from the Pennsylvania Stormwater BMP Manual have been completed and are provided	N

"**Plan drawings"**

D	Locations of BMPs are shown along with tributary drainage areas	D
D&N	Construction details are included for all PCSM BMPs	D
D	All easements and rights-of-way are shown on plan drawings.	D
D	Sensitive resources are shown (i.e. steep slopes, riparian, etc.)	D & N
D	Existing and proposed discharges & points of interest	D
D	Floodplain and floodway delineations	D
D	Locations and sufficient infiltration testing to represent proposed locations of volume and rate control BMPs	D
D	PCSM Plan Drawings are consistent with E&S Plan in relation to proposed contours, improvements, soils, wetlands, floodways, streams, discharge locations, E&S BMPs, etc.	D

Infiltration BMPs

D&N	All infiltration BMPs must have infiltration testing completed	N
D&N	All infiltration BMPs must have soil testing completed	N
D&N	All infiltration BMPs should be sited on un-compacted soils	D & N

BMP 6.4.2 Infiltration Basins

	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
	Do not install on recently placed fill (<5 years)	D & N
	Allow 2 foot buffer between bed bottom and seasonal high groundwater table	D & N

BMP 6.4.4 Infiltration Trench

_____	Perforated pipe set at a minimum slope in a stone filled, level-bottomed trench	D & N
_____	Limited in width (3 to 8 feet) and depth of stone (6 feet max recommended)	D & N
_____	Trench is wrapped in nonwoven geotextile (top, sides, and bottom)	D & N
_____	A minimum of 6" of topsoil is placed over trench and vegetated	D & N

BMP 6.4.5 Bio-retention

_____	Ponding depths generally limited to 12 inches or less	D & N
_____	Native vegetation that is tolerant of variability, salts and stress	D & N
_____	Modify soil with compost	D & N

BMP 6.4.8 Vegetated swale

D&N _____	Longitudinal slopes range from 1 to 6 %	D & N
D&N _____	Side slopes range from 3:1 to 5:1	D & N
D&N _____	Bottom width of 2 to 8 feet	D & N
D&N _____	Convey the 10-year storm event with a minimum of 6 inches of freeboard	D & N
D&N _____	Designed for non-erosive velocities up to the 10-year storm event	D & N

BMP 6.4.9 Vegetated Filter strip

_____	Filter Strip length is a function of the slope, vegetative cover, and soil type	D & N
_____	Minimum recommended length of filter strip is 25 feet	D & N
_____	Filter strip slope should never exceed 8%; less than 5% are preferred	D & N
_____	Level spreading devices are recommended to provide uniform sheet flow	D & N
_____	Maximum contributing drainage area slope is generally less than 5%	D & N
_____	Minimum filter strip width should equal the width of the drainage area	D & N

BMP 6.4.10 Infiltration Berm

_____	Maintain a minimum 2-foot separation to bedrock and high water table	D & N
_____	Berms should be relatively low, preferable no more than 24 inches in height	D & N
_____	If berms are to be mowed, the berm side slopes should not exceed a ratio of 4:1	D & N
_____	Berms should be vegetated with turf grass at a minimum	D & N

BMP 6.5.2 Runoff recapture and use

_____	Storage devices designed to capture a portion of small, frequent storm events	D & N
_____	Systems must provide for bypass or overflow of large storm events	D & N
_____	Water budget incorporating anticipated water inflow and usage required	D & N

Water Quality and Rate Control BMPs

BMP 6.6.1 Constructed Wetlands

_____	Adequate drainage area or proof of sustained base flow	D & N
_____	Maintenance of permanent water surface	D & N
_____	Relatively impermeable soils or engineered liner	D & N
_____	Sediment collection and removal	D & N
_____	Adjustable permanent pool and dewatering mechanism	D & N

BMP 6.6.2 Wet pond/Retention basin

D&N _____	Adequate drainage area or proof of sustained baseflow	D & N
D&N _____	Natural high groundwater table	D & N
D&N _____	Maintenance of permanent water surface	D & N
D&N _____	Should have at least 2 to 1 length to width ratio	D & N
D&N _____	Forebay for sediment collection and removal	D & N
D&N _____	Dewatering mechanism	D & N

BMP 6.6.3 Dry extended basin

_____	Hydraulic capacity controls effectiveness	D & N
_____	Ideal in combination with other BMPs	D & N

Restoration BMPs

BMP 6.7.1 Riparian buffer restoration

D&N _____	Reestablish buffer areas along perennial, intermittent, and ephemeral streams	D & N
D&N _____	Plant native, diverse tree and shrub vegetation	D & N
D&N _____	Create a short-term maintenance and long-term maintenance plan	D & N
D&N _____	Clear, well-marked boundary	D & N

BMP 6.7.2 Landscape restoration

_____	Minimize traditional turf lawn area	D & N
_____	Maximize landscape restoration area planted with native vegetation	D & N
_____	Protect landscape restoration area during construction	D & N
_____	Prevent post-construction erosion through adequate stabilization	D & N
_____	Minimize mowing (two times per year)	D & N

BMP 6.7.3 Soil amendment and restoration

_____	Physical loosening	D & N
_____	Compost amendments	D & N

BMP 6.7.4 Floodplain restoration

_____	Can prevent riparian problems from getting worse or can fix problems caused by historical practices	D & N
_____	Reattachment of root systems of floodplain vegetation/riparian areas connected to groundwater and/or base flow	D & N
_____	Removal of "legacy sediments" and associated nutrients stored within the stream corridors prior to release through bank erosion	D & N

Other BMPs and related structural measures

BMP 6.8.1 Level spreaders

_____	Must be level	D & N
_____	Are not applicable in areas with easily erodible soils and/or little vegetation	D & N
_____	Should safely diffuse at least the 10-year storm peak rate	D & N
_____	Bypassed flows should be stabilized in a sufficient manner	D & N

"A long-term operation and maintenance schedule, which provides for inspection of PCSM BMPs, including the repair, replacement, or other routine maintenance of the PCSM BMPs to ensure proper function and operation"

D&N _____	Inspection schedule of each permanent BMP is provided	N
D&N _____	Directions for maintenance and/or replacement of each BMP	N
D&N _____	Directions for sediment disposal	N
D&N _____	Responsible party (owner, operator, inspector) has been identified	N

"Procedures which ensure that the proper measures for recycling or disposal of materials associated with or from the PCSM BMPs are in accordance with DEP laws, regulations and requirements"

D&N _____	Project wastes are identified	N
D&N _____	Directions for recycling /disposal of wastes	D or N

"An identification of naturally occurring geologic formations or soil conditions that may provide hazards to the project or surrounding environment or have the potential to cause or contribute to pollution after earth disturbance activities are completed and PCSM BMPs are operational and development of a management plan to avoid or minimize potential pollution and its impacts"

N	Potential for geologic or soil conditions to cause pollution during construction	N
D&N	Instructions for proper handling and/or disposal of all materials which could cause pollution are provided	D
D	Typical details are provided for proper handling and/or disposal of all such materials	D
N/A	The locations of all such materials are clearly shown on the plan maps	D

"An identification of potential thermal impacts from post construction stormwater to surface waters of this Commonwealth including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts"

N	Applicant has described how thermal impacts of stormwater runoff from the project site were avoided	N
D&N	Applicant has described how thermal impacts were minimized and mitigated	D & N

"A riparian forest buffer management plan when required under § 102.14 (relating to riparian buffer requirements)"

D	Existing and/or proposed buffers are shown on the plan drawings	D